US010385630B2

(12) **United States Patent**
Nilsen

(10) **Patent No.: US 10,385,630 B2**
(45) **Date of Patent: Aug. 20, 2019**

(54) **RISER TENSIONING SYSTEM**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/743,674**

(22) PCT Filed: **Jun. 28, 2016**

(86) PCT No.: **PCT/NO2016/050144**
§ 371 (c)(1),
(2) Date: **Jan. 11, 2018**

(87) PCT Pub. No.: **WO2017/010889**
PCT Pub. Date: **Jan. 19, 2017**

(65) **Prior Publication Data**

US 2018/0202243 A1 Jul. 19, 2018

(30) **Foreign Application Priority Data**

Jul. 13, 2015 (NO) 20150914

(51) **Int. Cl.**
E21B 19/00 (2006.01)

(52) **U.S. Cl.**
CPC ***E21B 19/006*** (2013.01)

(58) **Field of Classification Search**
CPC E21B 19/006; E21B 19/004; E21B 19/02
See application file for complete search history.

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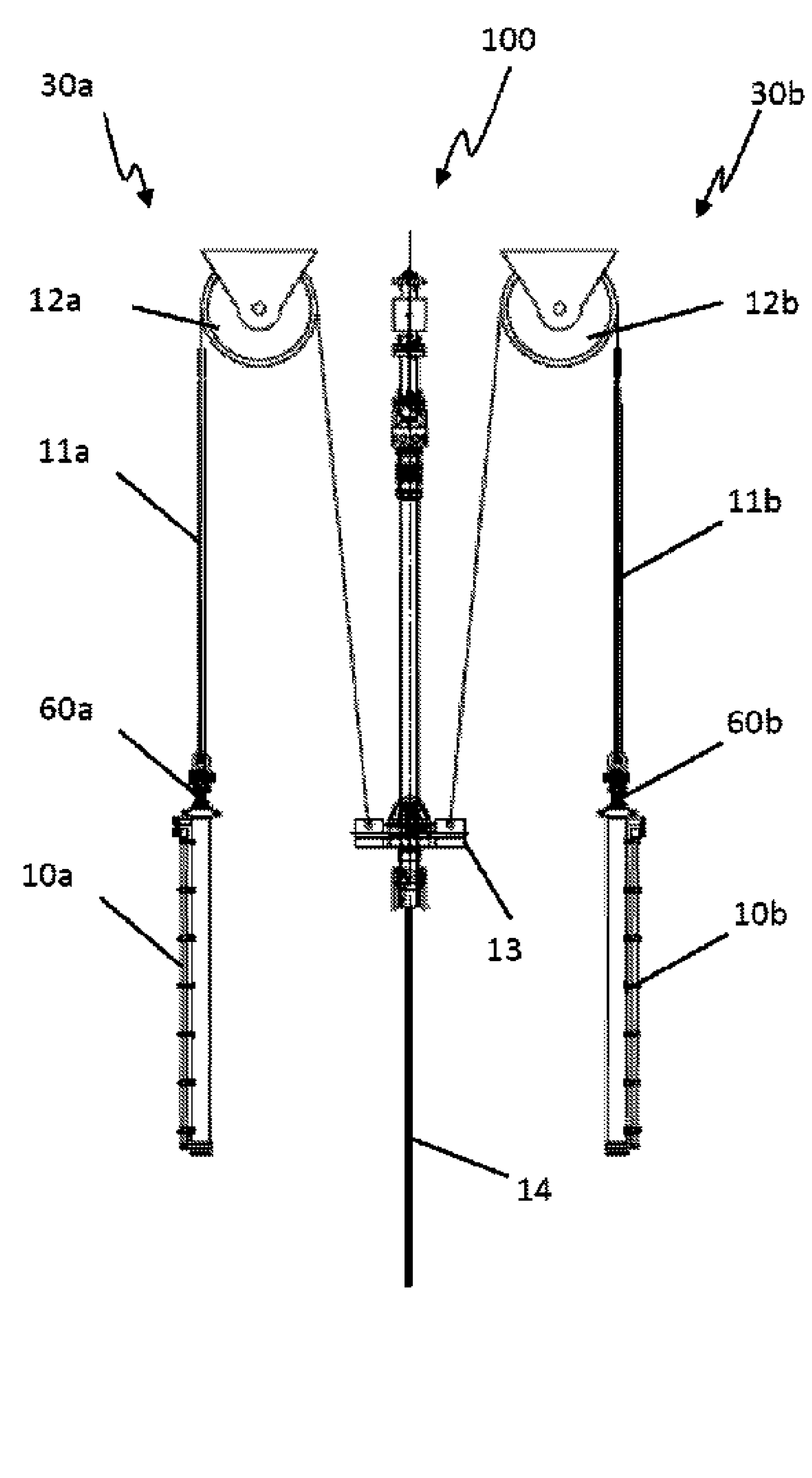
(57) **ABSTRACT**

A riser tensioning system for providing a tensioning to a riser connected to a floating installation via a tension ring. The riser tensioning system includes at least one riser tensioner assembly. Each of the at least one riser tensioner assembly includes a riser tensioning cylinder comprising a cylinder rod, at least one sheave, and a wireline with a first end and a second end. The first end is fixed to the tension ring, and the second end is fixed to the cylinder rod. The wireline extends between the tension ring and the cylinder piston via the at least one sheave.

20 Claims, 11 Drawing Sheets



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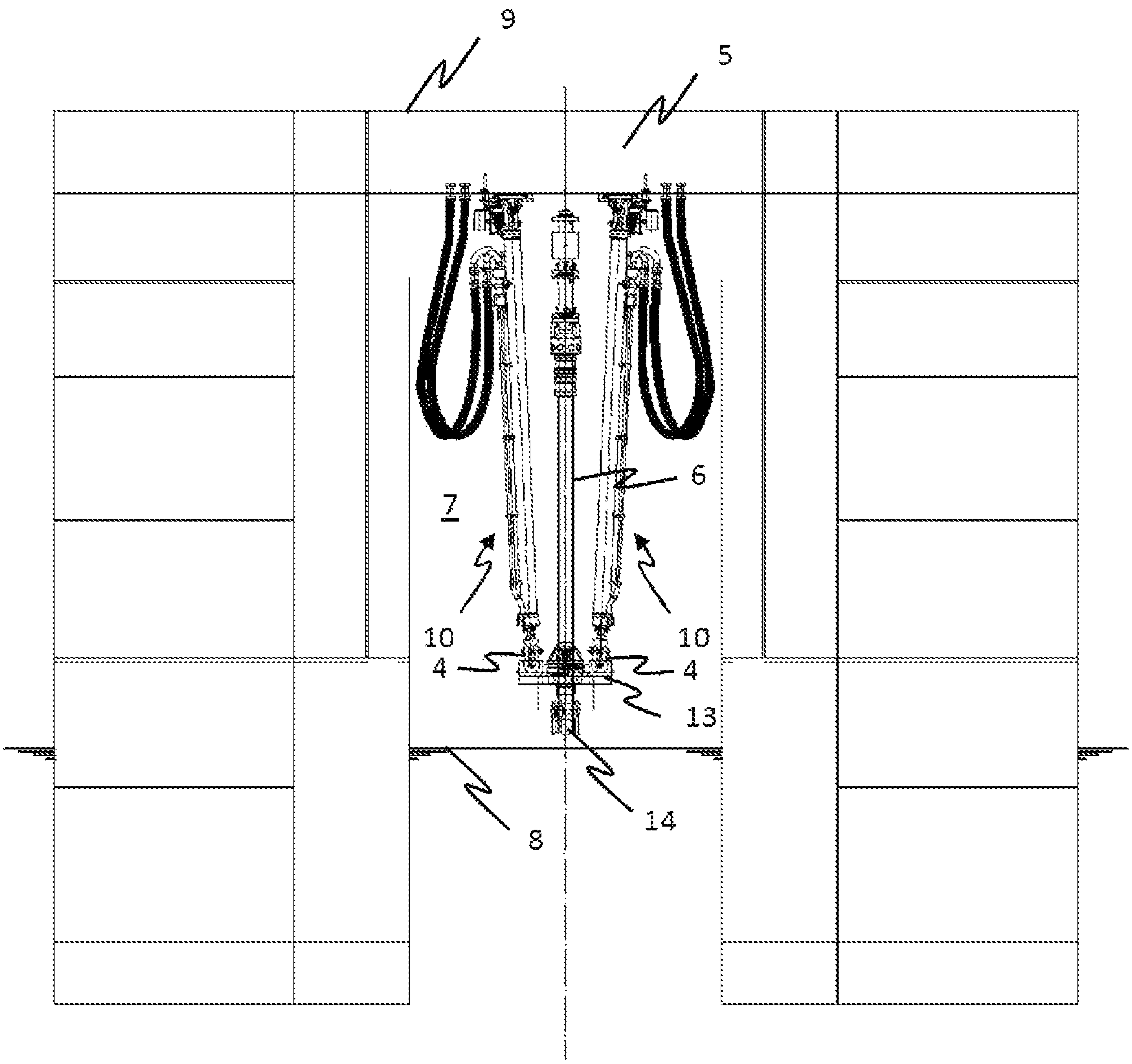

Fig. 1
(Prior Art)

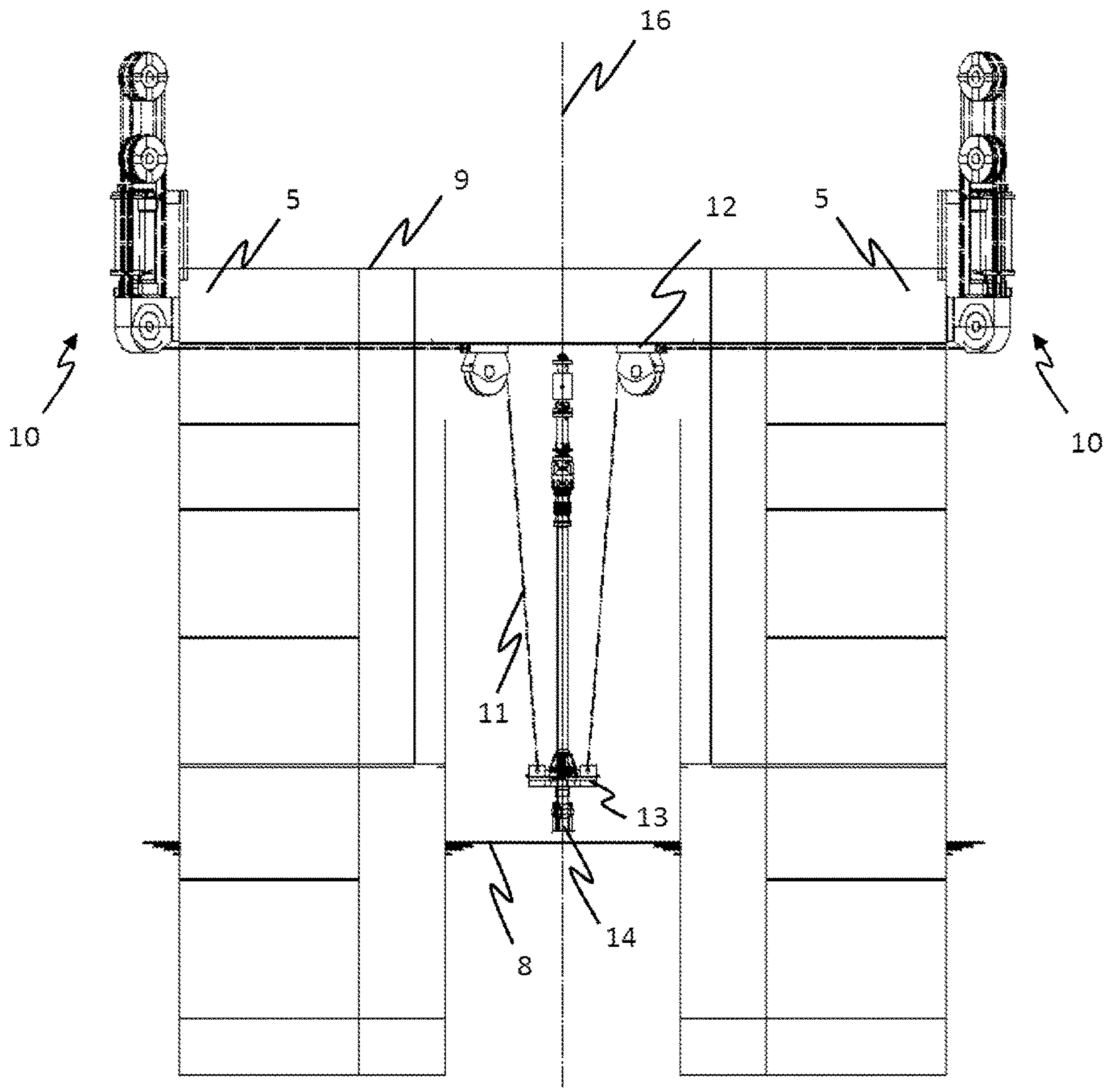

Fig. 2
(Prior Art)

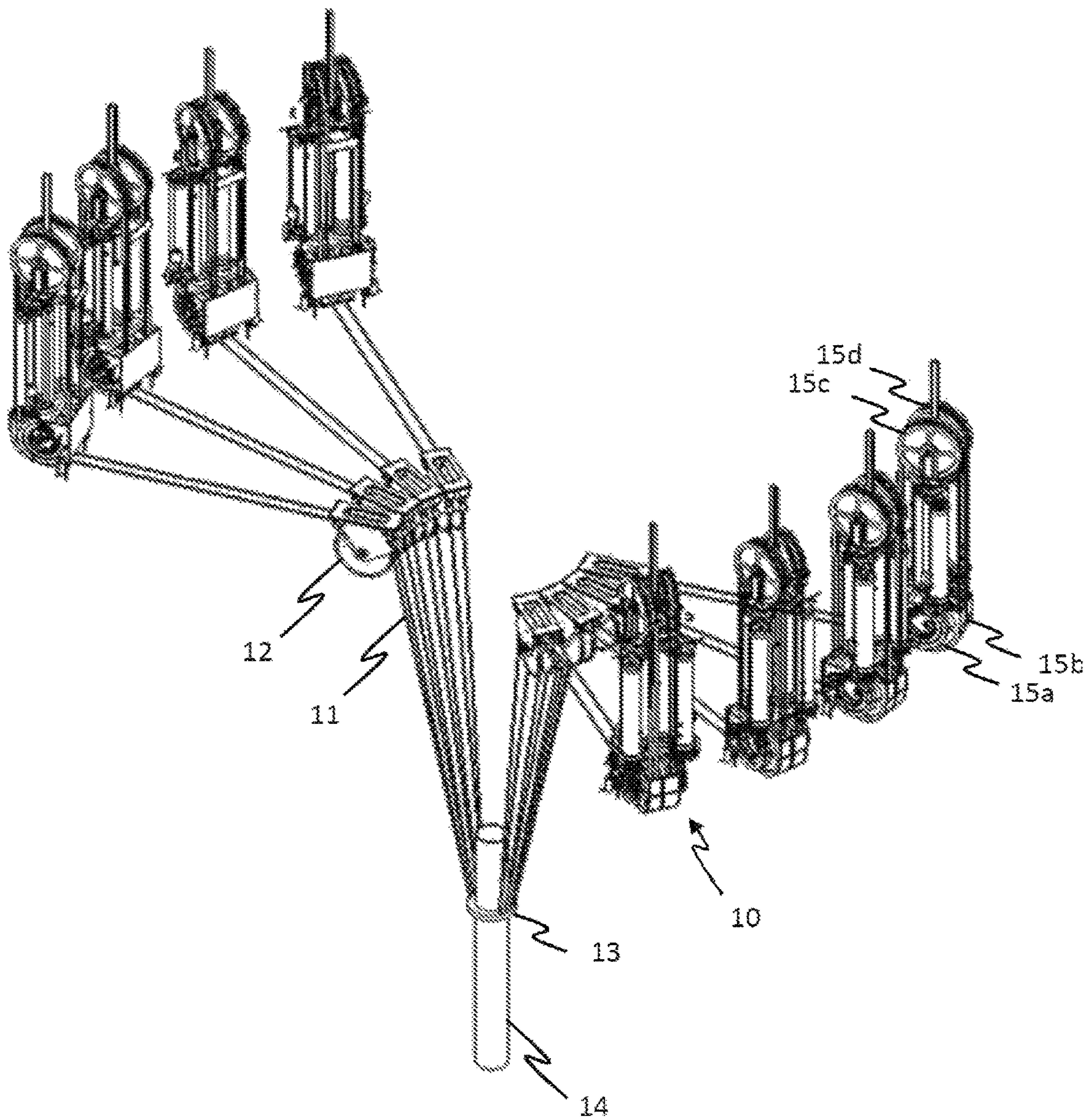

Fig. 3
(Prior Art)

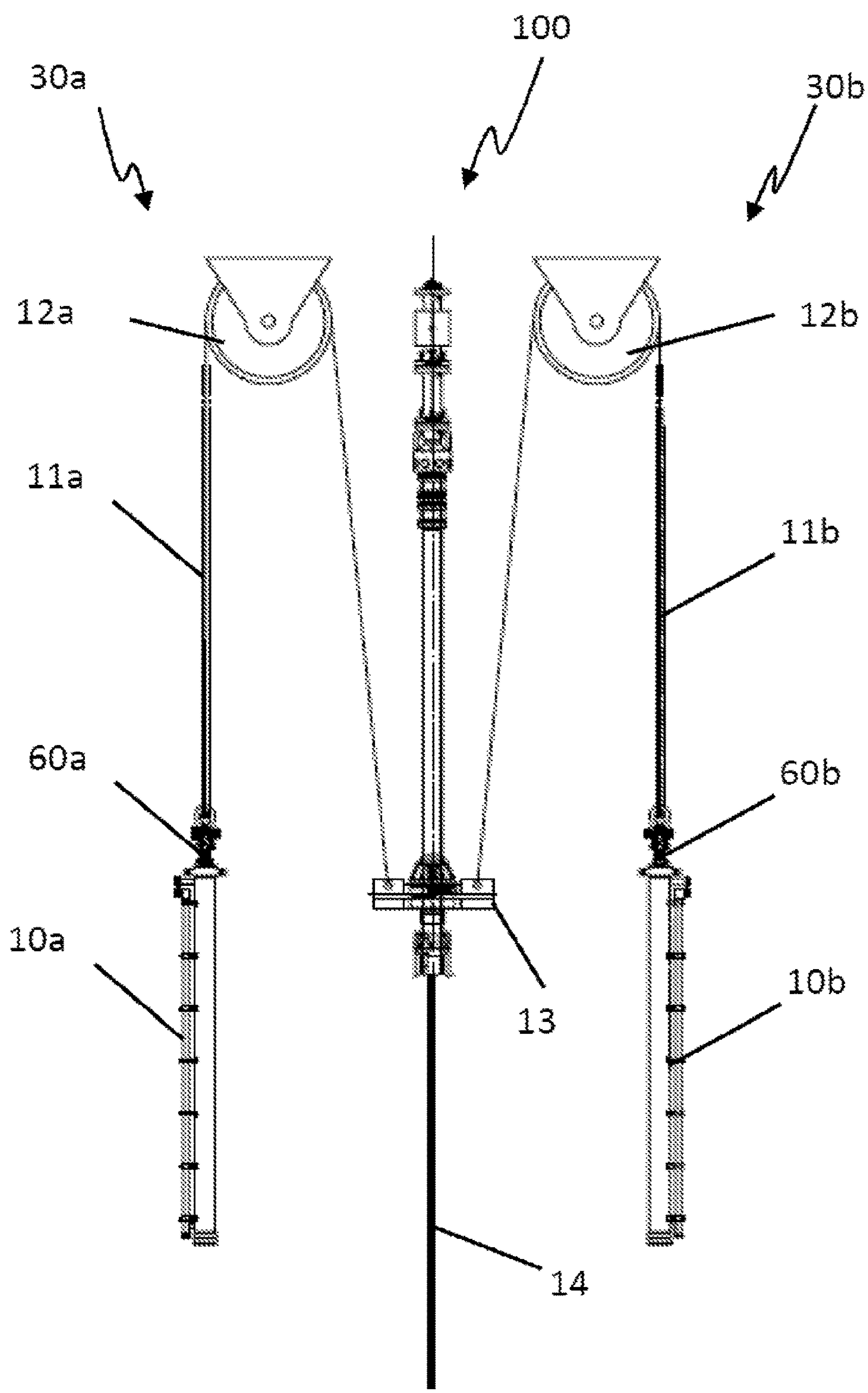

Fig. 4

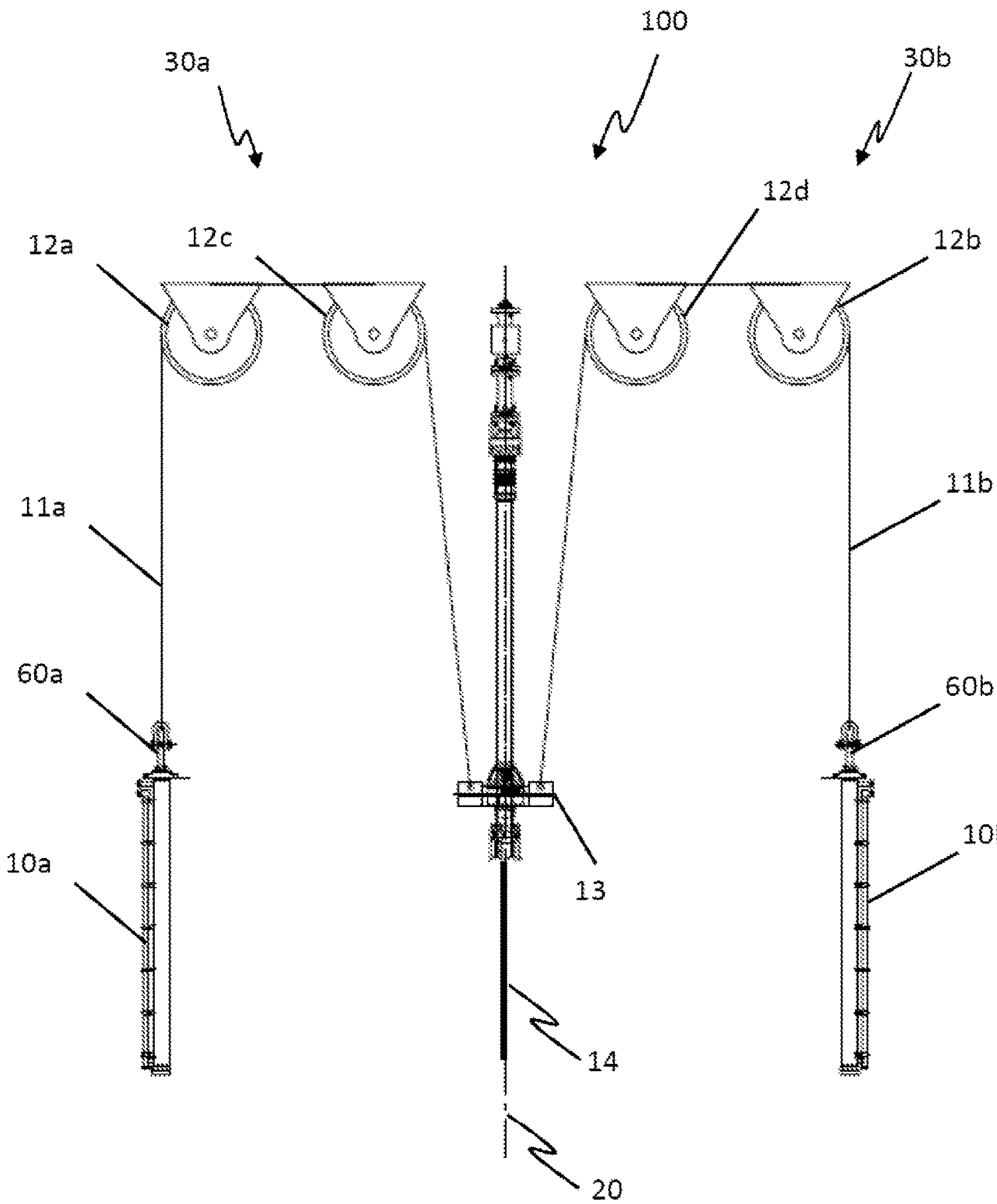

Fig. 5

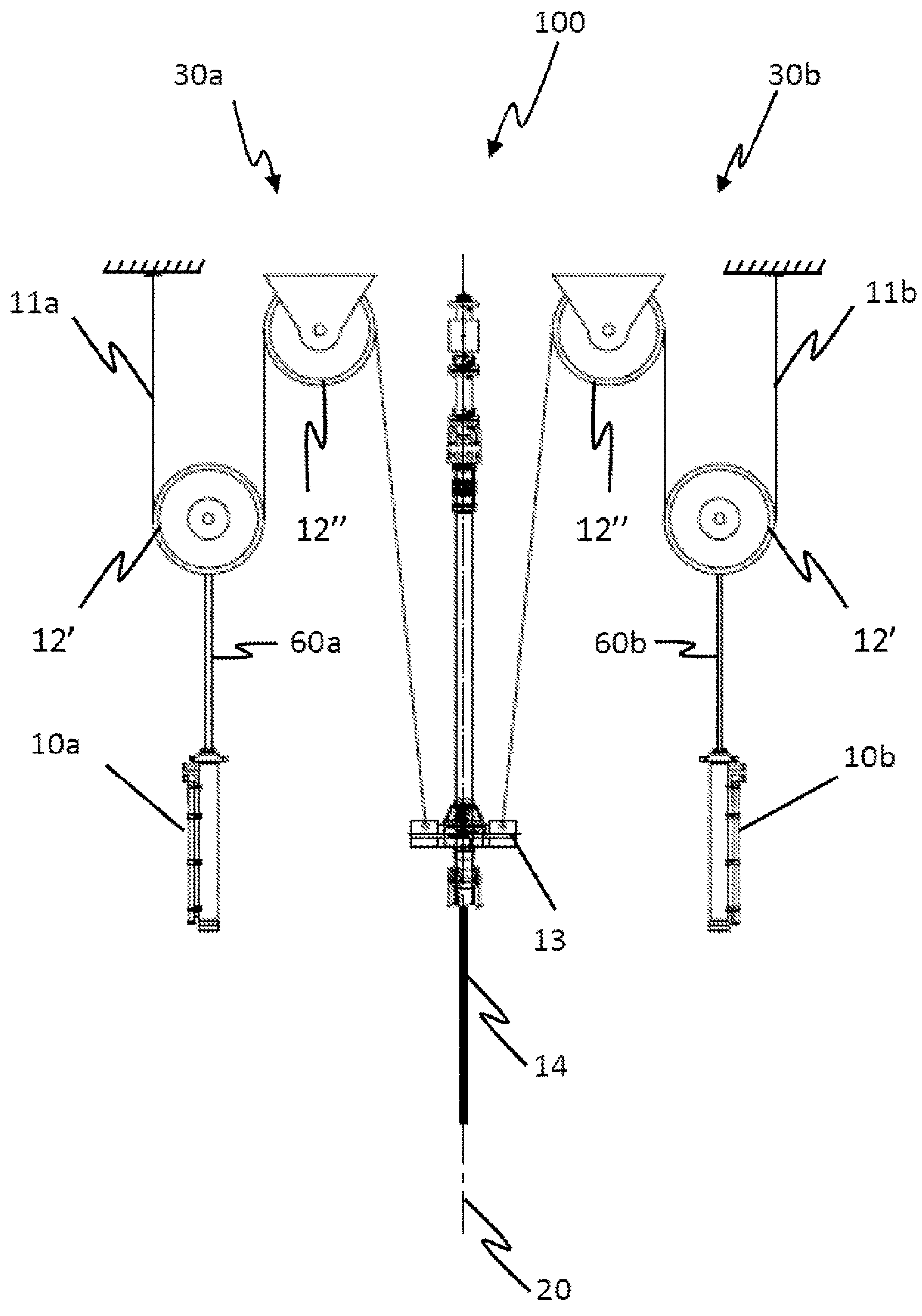

Fig. 6

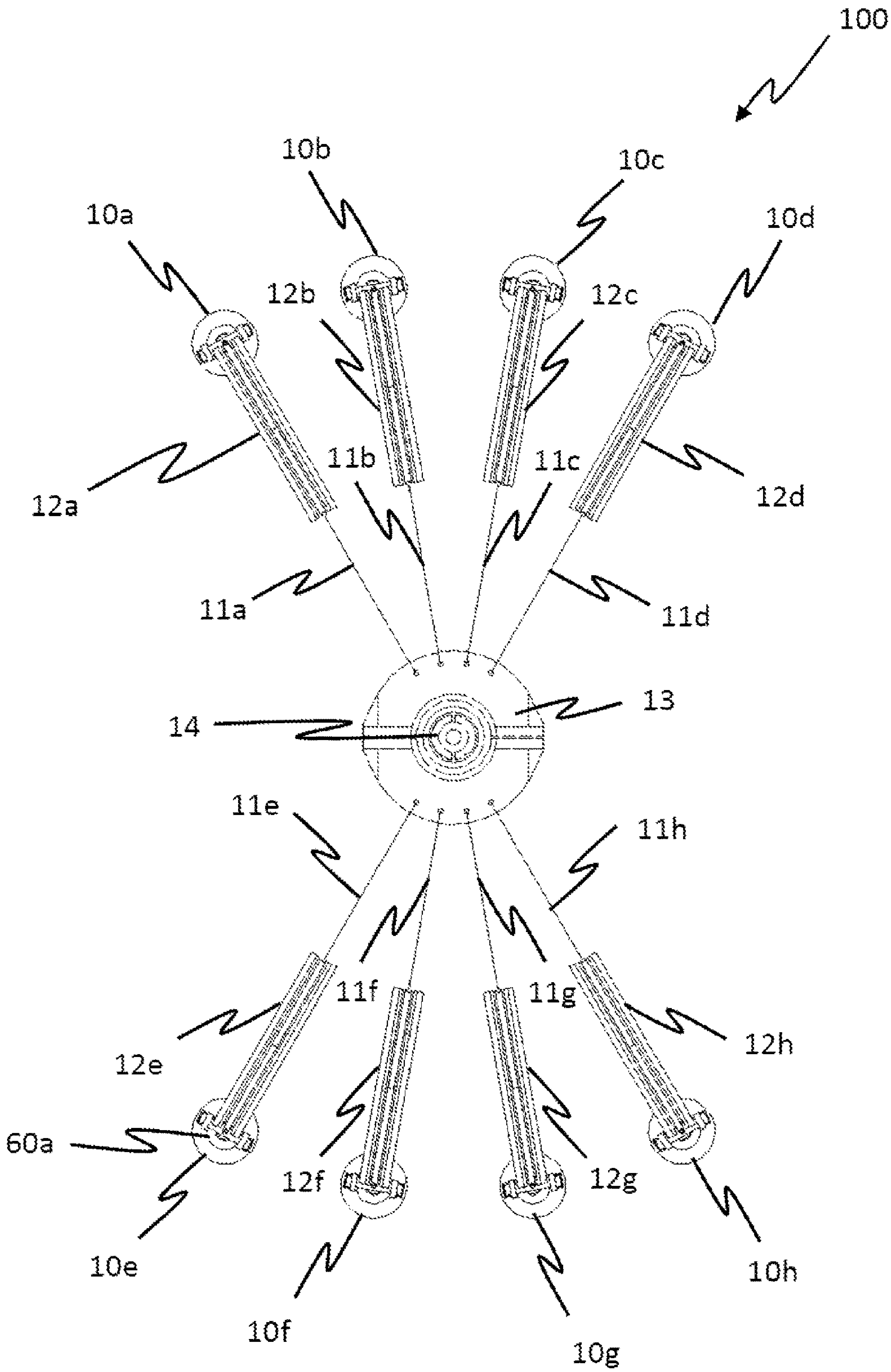
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Fig. 7

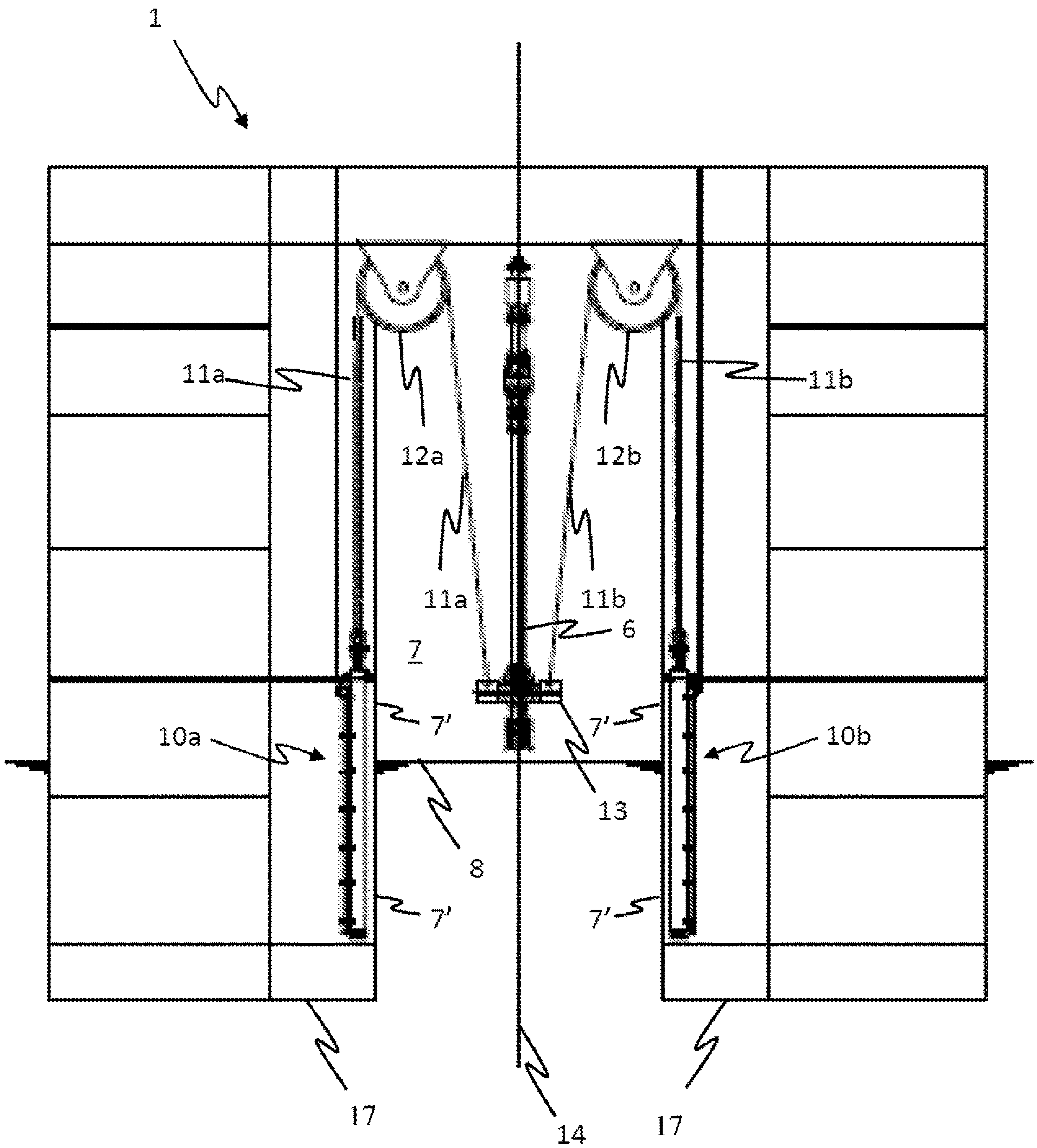

Fig. 8

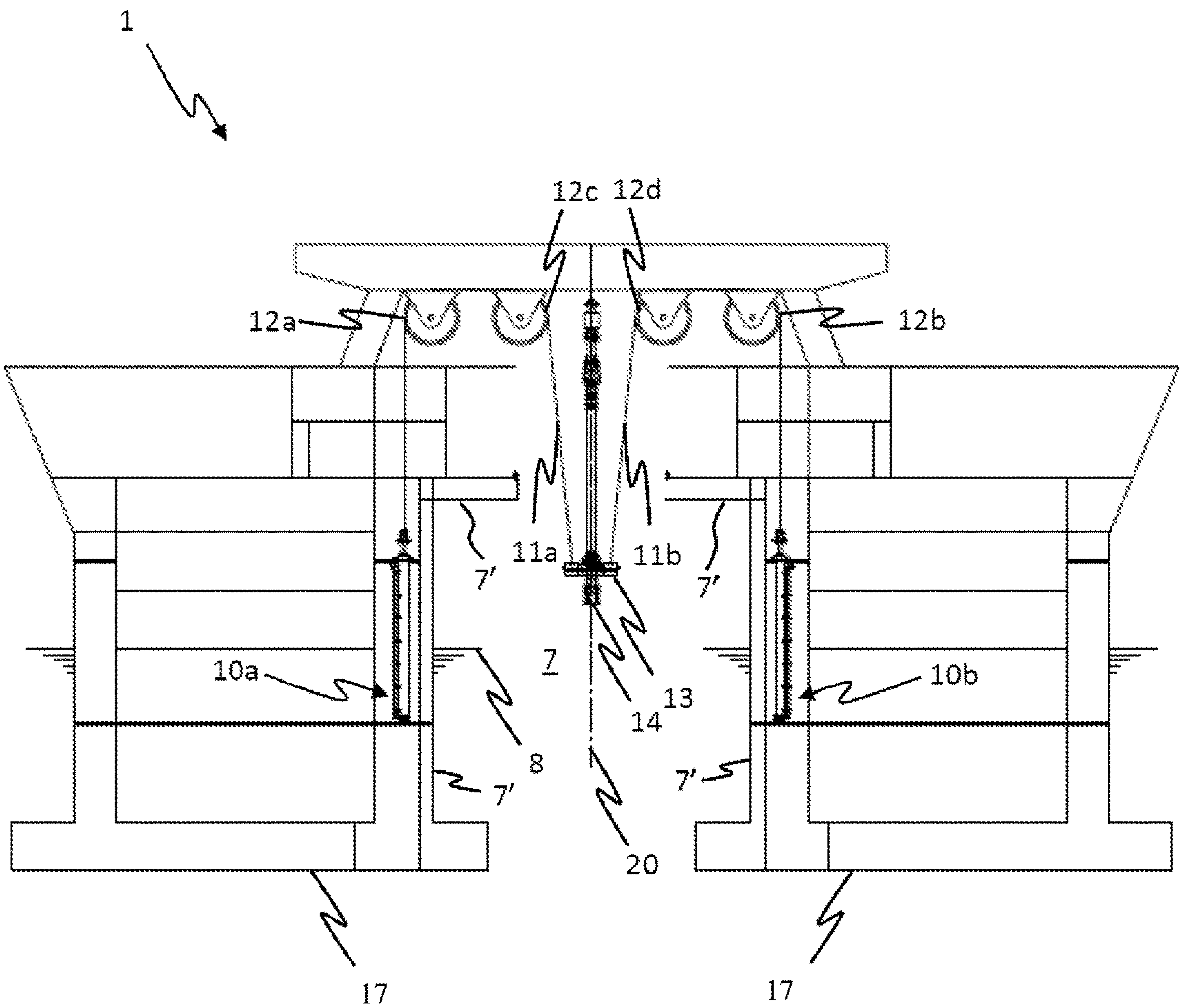

Fig. 9

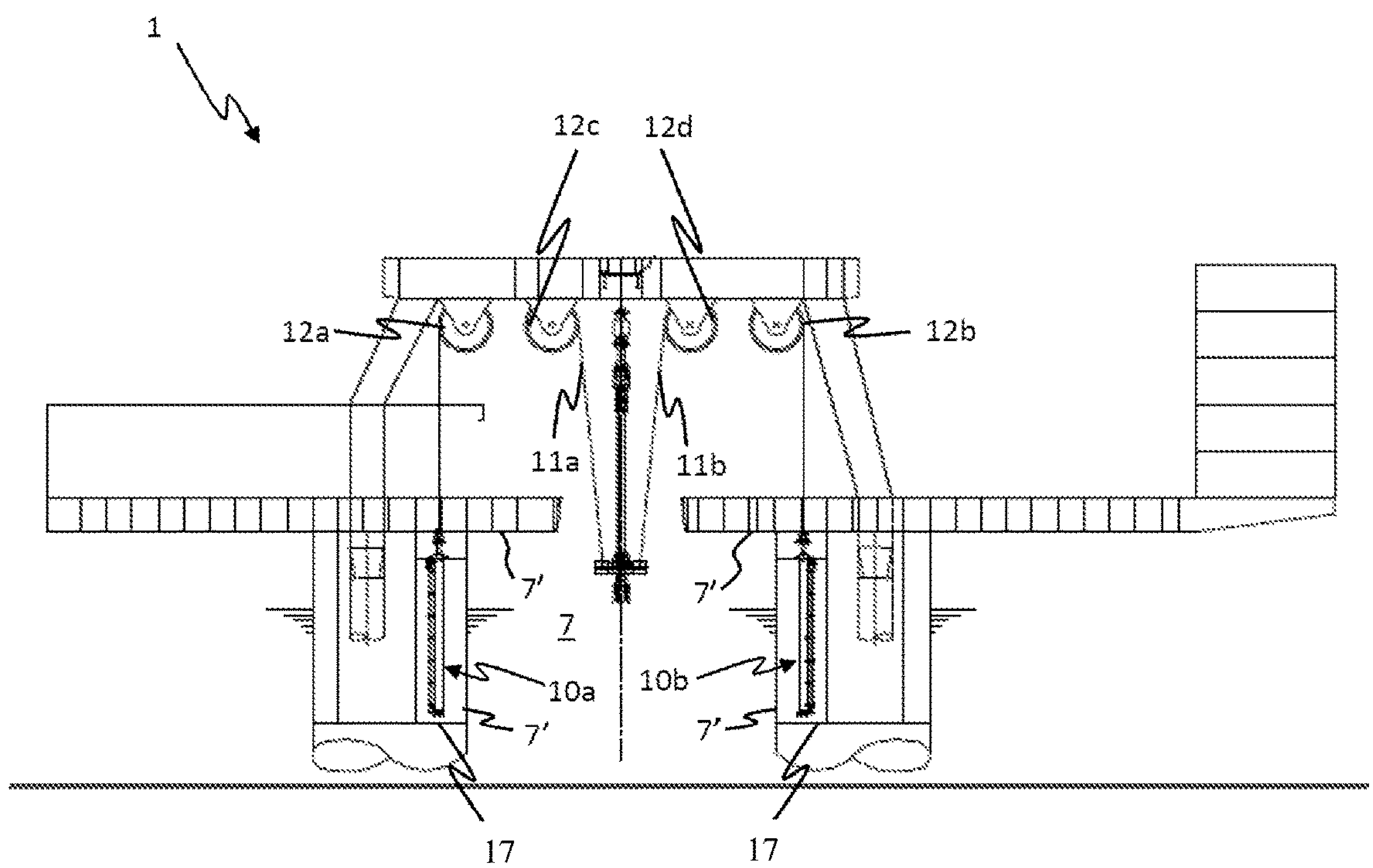

Fig. 10

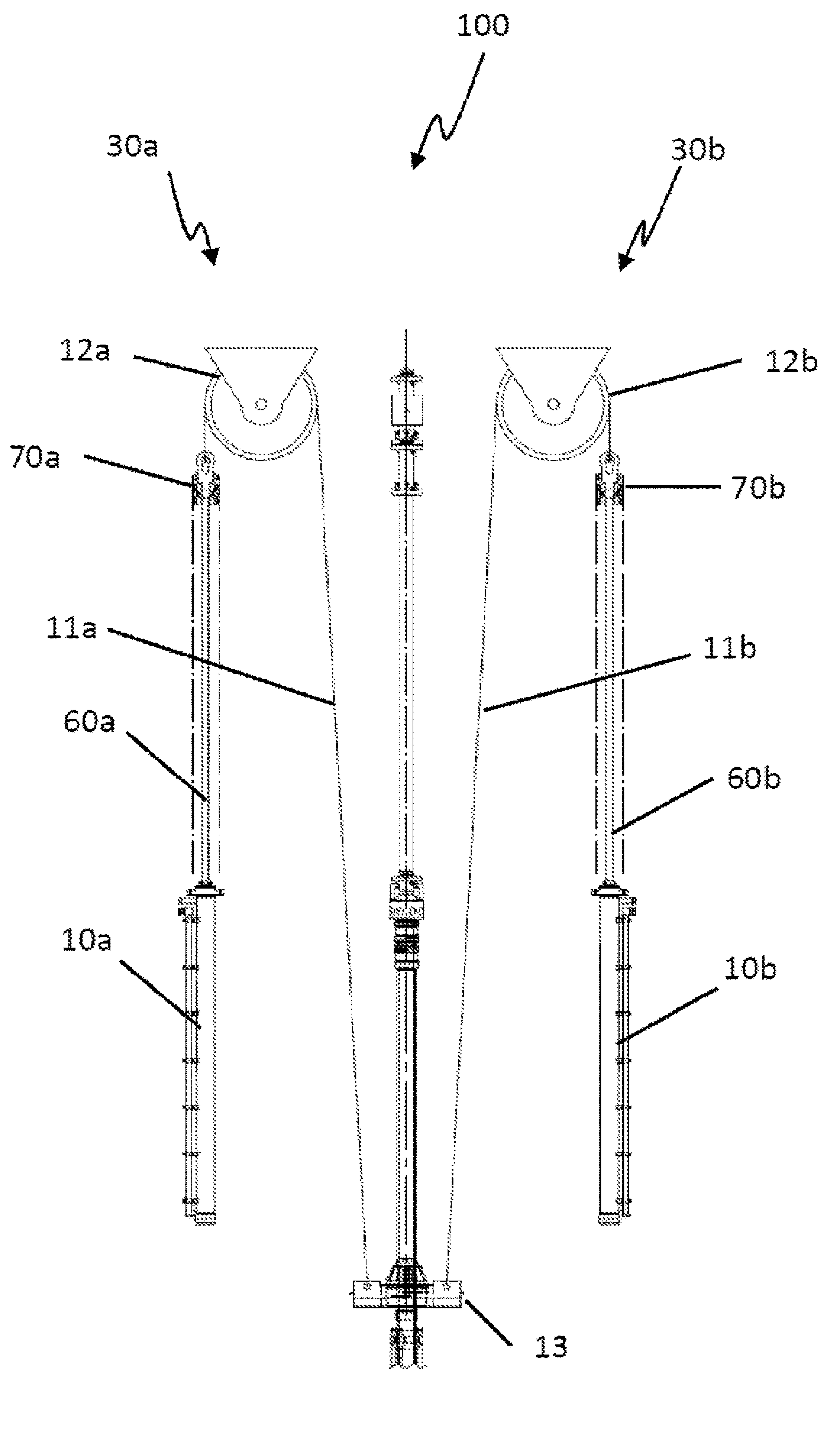

Fig. 11

RISER TENSIONING SYSTEM

CROSS REFERENCE TO PRIOR APPLICATIONS

This application is a U.S. National Phase application under 35 U.S.C. § 371 of International Application No. PCT/NO2016/050144, filed on Jun. 28, 2016 and which claims benefit to Norwegian Patent Application No. 20150914, filed on Jul. 13, 2015. The International Application was published in English on Jan. 19, 2017 as WO 2017/010889 A1 under PCT Article 21(2).

FIELD

The present invention relates generally to the field of floating offshore platforms or vessels for the exploitation of undersea deposits of petroleum and natural gas. The present invention relates more specifically to risers tensioners and to a system for providing tension to risers which extend from a subsea wellhead or subsurface structure to a floating platform or vessel.

BACKGROUND

Offshore platforms for the exploitation of undersea petroleum and natural gas deposits typically support risers that extend to the platform from one or more wellheads or structures on the seabed. In deep water applications, floating platforms (such as spars, tension leg platforms, extended draft platforms, and semi-submersible platforms) are typically used. These platforms are subject to motion due to wind, waves, and currents. The risers employed with such platforms must therefore be tensioned to permit the platform to move relative to the risers. Riser tension must also be maintained so that the riser does not buckle under its own weight. The tensioning mechanism must accordingly exert a substantially continuous tension force to the riser within a well-defined range.

Hydro-pneumatic tensioner systems are one form of riser tensioning mechanism typically used to support risers known as "Top Tensioned Risers" on various platforms. A plurality of passive hydraulic cylinders with pneumatic accumulators are thereby connected between the platform and the riser to provide and maintain the necessary riser tension. Platform responses to the above mentioned environmental conditions, mainly heave and horizontal motions, create changes in platform position relative to the riser, causing the tensioning cylinders to stroke in and out. The spring effect resulting from the gas compression or expansion during a platform's vertical and horizontal movement relative to the seabed partially isolates the riser from the platform's motions.

Riser tensioners constituting such hydro-pneumatic tensioning systems comprise cylinders in which the cylinder rods are at least indirectly connected to the riser so that the pressure induced movements of the rod relative to its support results in the desired riser tensioning. Such hydro-pneumatic tensioner systems are presently produced in a variety of dimensions and sizes. Examples of typical state of the art riser tensioner systems are disclosed in WO 2004/013452, U.S. Pat. Nos. 4,886,397, 3,902,319, GB 2.109.036, WO 2012/016765 and WO 2014/090682.

Known riser tensioning systems include so-called "Direct Acting Tensioner" (DAT) systems and so-called "Wireline Riser Tensioner" (WLT) systems. An example of such systems is described in WO 2012/016765 (for example, FIGS. **4** and **5**).

The location of the DAT systems within a moon pool area of a floating platform or vessel results in the risk of exposure to seawater which introduces challenges related to the corrosive environment and heavy accelerations of cylinder and rod. DAT systems may also show poor performance due to internal load deviations within the system. There may, for example, be flow resistance in the pipework/hoses between the tensioning cylinders and accumulator(s).

The alternative WLT system is large and may require a fairly complex arrangement if the system is to be applied to drilling vessels with a setback/fingerboard (for storing drill pipes, drill collars, etc.) that is situated lower than the drill floor. Such a low setback arrangement is demanding, and most users choose DAT systems in these situations. In addition to the complex arrangement in drilling vessels with low setback, the WLT systems suffer from high load variations due to friction over the plurality of sheaves. The repeated bending of the wire over a number of sheaves increases wire wear. A cut and slip configuration or complete replacement of the wire may therefore be required. The WLT systems are often heavy compared to other riser tensioning systems, typically around 500 MT depending on capacity.

SUMMARY

An aspect of the present invention is to provide a riser tensioning system that at least mitigates the above disadvantages. An aspect of the present invention is more specifically to reduce the risk of seawater exposure while avoiding a complex arrangement when installing the system, thereby also making such a system suitable for use on a drilling vessel with a low setback.

A further aspect of the present invention is to provide a riser tensioning system having a low weight compared to the weight of a typical WLT system, for example, a weight comparable to the weight of a typical DAT system.

A further aspect of the present invention is to provide a riser tensioning system that does not require a wire rope cut and slip configuration.

In an embodiment, the present invention provides a riser tensioning system for providing a tensioning to a riser connected to a floating installation via a tension ring. The riser tensioning system includes at least one riser tensioner assembly. Each of the at least one riser tensioner assembly comprises a riser tensioning cylinder comprising a cylinder rod, at least one sheave, and a wireline comprising a first end and a second end. The first end is fixed to the tension ring, and the second end is fixed to the cylinder rod. The wireline is configured to extend between the tension ring and the cylinder piston via the at least one sheave.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is described in greater detail below on the basis of embodiments and of the drawings in which:

FIG. **1** shows a cross sectional view of a prior art Direct Acting Tensioner (DAT) system arranged within a moon pool of a drillship;

FIG. **2** shows a cross sectional view of a prior art Wireline Riser Tensioner (WLT) system arranged on a drillship;

FIG. **3** shows a perspective view of a prior art Wire Riser Tensioner (WLT) system;

FIG. **4** shows a cross sectional view of a riser tensioner system in accordance with the present invention;

FIG. **5** shows a cross sectional view of a further riser tensioner system in accordance with the present invention;

FIG. **6** shows a cross sectional view of a riser tensioner system in accordance with a further aspect of the present invention;

FIG. **7** shows a top view of an arrangement of riser tensioner systems according to the present invention;

FIG. **8** shows a cross sectional view of a riser tensioner system in accordance with the present invention arranged within a drillship hull;

FIG. **9** shows a cross sectional view of the riser tensioner system of FIG. **5** where the riser tensioner cylinders are arranged within a typical buoy hull;

FIG. **10** shows a cross sectional view of the riser tensioner system of FIG. **5** where the riser tensioner cylinders are arranged within a typical semi-submersible hull; and

FIG. **11** shows a cross sectional view of a further riser tensioner system in accordance with the present invention.

DETAILED DESCRIPTION

In an embodiment, the present invention provides a riser tensioning system for providing tensioning to a riser connected to a floating installation via a tension ring, the system comprising at least one riser tensioner assembly, each riser tensioner assembly comprising: a riser tensioning cylinder, the riser tensioning cylinder having a cylinder rod; at least one sheave; a wireline having a first end and a second end, the first end being fixed to the tension ring and the second end being fixed to the cylinder rod; whereby the wireline extends between the tension ring and the cylinder rod via the at least one sheave.

Providing a riser tensioning system with a wireline having its end fixed to the cylinder piston and extending to a tension ring via at least one sheave may eliminate the need to provide sheaves fixed to the riser tensioning cylinders, thus making these more flexible in their placement. Having the ends of the wireline fixed (i.e., fixedly connected) to the tension ring and the cylinder rod also allows for an approximately 1:1 transmission ratio between the cylinder rod and the tension ring, thereby avoiding frictional losses associated with systems having further sheaves for gearing.

The at least one sheave may be pivotable around an axis parallel to the riser during use.

The ratio between the diameter (d) of the wireline and the diameter (D) of at least one of the at least one sheave may be at least 30. This avoids the need to perform cut-and-slip or replacement of the wireline.

The riser tensioning system may comprise 4, 6, 8 or 10 riser tensioner assemblies. The cylinder rod may work in tension.

In an embodiment, the present invention provides a riser tensioning system for providing tensioning to a riser connected to a floating installation via a tension ring, the system comprising at least one riser tensioner assembly, each riser tensioner assembly comprising: a riser tensioning cylinder, the riser tensioning cylinder having a cylinder rod; at least one first sheave fixed to the cylinder rod; at least one second sheave; a wireline having a first end and a second end, the first end being fixed to the tension ring and the second end being fixed to the floating installation; whereby the wireline extends between the tension ring and the cylinder piston via the at least one first sheave and the at least one second sheave.

The at least one second sheave may be pivotable around an axis parallel to the riser during use.

The ratio between the diameter (d) of the wireline and the diameter (D) of at least one of the at least one first or second sheave may be at least 30.

The riser tensioning system may comprise 4, 6, 8 or 10 riser tensioner assemblies. The cylinder rod may work in tension.

In an embodiment, the present invention provides a floating installation comprising a riser tensioning system.

The floating installation may comprise a physical boundary that at least partly covers the riser tensioning cylinder of the at least one riser tensioner assembly, the physical boundary being configured to at least partly block any direct exposure of ambient water onto the riser tensioning cylinder during use.

The floating installation may further comprise a moon pool, wherein the riser tensioning cylinder of the at least one riser tensioner assembly is placed outside the moon pool.

The physical boundary may comprise the walls of the moon pool.

The riser tensioning cylinder of the at least one riser tensioner assembly may be placed below a drill floor and a deck of the floating installation.

The riser tensioning cylinder of the at least one riser tensioner assembly may be placed in a base structure of the floating installation, the base structure extending at least partly around the moon pool and below a waterline, wherein the riser tensioning cylinder is positioned in the base structure at least partly below the waterline.

A system according to the present invention is applicable for drillships, semi-submersibles, and buoys with both low setback arrangements and setback on drill floor.

The present invention is described further below under reference to the drawings. Numerous specific details are thereby introduced to provide a thorough understanding of embodiments of the system. One skilled in the relevant art, however, will recognize that these embodiments can be practiced without one or more of the specific details, or with other components, systems, etc. In other instances, well-known structures or operations are not shown, or are not described in detail, to avoid obscuring aspects of the disclosed embodiments.

FIG. **1** shows a typical prior art DAT system arranged on an offshore installation, where the DAT system consists of a plurality of direct acting tensioning cylinders **10**, pulling on a marine riser **14**. The tensioning cylinders **10** are connected to a tension ring **13** via tension ring shackles **4**. Supported by the structure underneath drill floor area **5** and connected to a telescopic joint **6** load ring, it generates a nearly constant pull on the riser **14**.

In these systems, the tensioning cylinders **10** are located in a moon pool area **7** provided in the offshore installation, directly above the water line **8**. The main components are the tensioning cylinders **10** which generate a pulling force on the riser **14**. This pulling force is generated by a pneumatic pressure in a closed volume. The system is completely passive and needs very little attention during a drilling operation if well maintained. Each tensioning cylinder **10** normally has a positioning system to determine position, speed and direction of the rod movement. A cylinder rod side of the cylinder is connected to a high pressure accumulator (not shown) via a shut off valve, and a cylinder piston side of the cylinder is connected to a low pressure vessel (not shown) for nitrogen preservation. A hose and a gooseneck connects the tensioning cylinders **10** to shut off skids placed in moon pool area **7**. DAT systems normally have a low weight compared to WLT-systems, which systems will be described below.

FIGS. **2** and **3** show typical prior art WLT systems arranged on an offshore installation. In such a system, the wireline riser tensioner cylinders **10** are located in the drill floor area **5**. The wireline riser tensioner cylinders **10** are typically placed symmetrically around a well center axis **16** on drill floor level.

The WLT system is designed to keep close to constant tension in the marine riser **14** via a plurality of wirelines **11**. It maintains the tension in each wireline **11**, which is connected to a tension ring **13** on the marine riser **14**. The wireline **11** from the tension ring **13** runs over pivot hinged idler sheaves **12** and then around the sheave assemblies **15***a-d* on each end of the tensioning cylinders **10**. The wireline **11** may then run, for example, three turns around a snubber drum (not shown) with the end of wireline **11** being anchored to a clamp (not shown).

The WLT system is generally more protected from seawater exposure compared to the DAT system since the riser tensioning cylinders **10** are not located in the moon pool area.

FIG. **4** shows a first embodiment of a riser tensioning system **100** for a floating installation according to the present invention, where the riser tensioning system **100**, for the sake of simplicity, is shown with two individually operated riser tensioning assemblies **30***a* and **30***b*. Each of the riser tensioning assemblies **30***a* and **30***b* comprises a respective individually operated riser tensioning cylinder **10***a*, **10***b*, sheaves **12***a*, **12***b* and wirelines **11***a*, **11***b*.

The wireline **11***a* is connected at one end to a cylinder rod **60***a* of the tensioning cylinder **10***a*, runs over a sheave **12***a* and, at its other end, is connected to a tension ring **13** which supports a marine riser **14**.

Similarly, the wireline **11***b* is connected at one end to a cylinder rod **60***b* of the tensioning cylinder **10***b*, runs over a sheave **12***b* and, at its other end, is connected to the tension ring **13** which supports the marine riser **14**. The marine riser **14** extends downwards towards a sea floor along a riser axis **20** (see FIG. **5**.).

Each of the sheaves **12***a* and **12***b* may be pivotable around a vertical axis. In use, the sheaves **12***a* and **12***b* may be fixed at a suitable point in the structure of the floating installation; the sheaves **12***a* and **12***b* can, for example, be fixed above or in the vicinity of a moon pool **7** (see FIGS. **8-10**).

FIG. **5** shows a second embodiment of the riser tensioning system **100** according to the present invention where a wireline **11***a* extends between a cylinder rod **60***a* of the tensioning cylinder **10***a* and the tension ring **13**, while a wireline **11***b* extends between a cylinder rod **60***b* of the tensioning cylinder **10***b* and the tension ring **13**. In this embodiment, each of the wirelines **11***a*, **11***b* runs over a respective first sheave **12***a* or **12***b*, and a respective second sheave **12***c* or **12***d*. The sheaves **12***c* and **12***d* may be pivotable around a vertical axis and can, in use, be fixed above or in the vicinity of a moon pool **7** (see FIGS. **8-10**).

FIG. **5** shows the riser tensioning system **100**, for the sake of simplicity, with only two individually operated riser tensioning assemblies. It should be understood, however, that the riser tensioning system **100** according to the present invention can comprise more than two riser tensioning assemblies, as will be explained according to FIG. **7**.

FIG. **6** shows another embodiment according to an aspect of the present invention. In this embodiment, there is provided a riser tensioning system **100** for providing tensioning to a marine riser **14** connected to a floating installation **1** (see FIGS. **8-10**) via a tension ring **13**. The cylinder rods **60***a* and **60***b* are, at their ends, connected to sheaves **12'**. The wirelines **11***a* and **11***b* extend from a fixation point in the structure of the installation **1** (for example, a deck) and are in their other ends connected to the tension ring **13**. The wirelines **11***a* and **11***b* extend, respectively, via the sheaves **12'** connected to the cylinder rods **60***a* and **60***b*, via a second sheave **12"** connected to the structure of the installation **1** and to the tension ring **13**. The cylinder rods **60***a* and **60***b* operate in tension, and, via the sheaves **12'**, provide tension to the wirelines **11***a* and **11***b*. In this embodiment, a transmission ratio of 1:2 between the cylinder rod and wireline motion can be obtained, thus permitting a shorter design stroke length of the tensioning cylinders **10***a* and **10***b* than the distance travelled by the tension ring **13**.

FIG. **7** shows, from above, the embodiment of the riser tensioning system **100** according to FIG. **4**, where it can be seen that the embodiment of the riser tensioning system **100** comprises eight individual riser tensioning assemblies, each comprising tensioning cylinders **10***a*-**10***h*, the tensioning cylinders **10***a*-**10***h* being arranged in two groups, each group comprising four tensioning cylinders **10***a*-**10***d*, **10***e*-**10***h*, where the groups of tensioning cylinders are placed opposite each other around a tension ring **13** for a marine riser **14**.

Each of the tensioning cylinders **10***a*-**10***h* are connected to a respective wireline **11***a*-**11***h*, each wireline **11***a*-**11***h* extending between a cylinder rod (see, for example, FIG. **4**) of the tensioning cylinder **10***a*-**10***h* and the tension ring **13**, and being run over respective sheaves **12***a*-**12***h*.

FIG. **8** shows the riser tensioning system **100** according to FIG. **4** arranged in an offshore installation **1**, where the tensioning cylinders **10***a*-**10***h* (only two tensioning cylinders **10***a*, **10***b* are shown for the sake of simplicity) are arranged around a moon pool **7** with a marine riser **14** therein.

A physical boundary in the form of walls **7'** at least partly covers the tensioning cylinders **10***a*-**10***h* and, optionally, the sheaves **12***a*-**12***h*, so that the tensioning cylinders **10***a*-**10***h* and the sheaves **12***a*-**12***h* are not directly exposed to seawater, or at least partly protected from exposure to seawater.

In an embodiment, the walls **7'** can, for example, form part of the structure of the moon pool **7**. The tensioning cylinders **10***a*-**10***h* are advantageously placed outside the moon pool **7**. In an embodiment, the tensioning cylinders **10***a*-**10***h* can, for example, be placed outside a moon pool **7** and below a drill floor **5** and a deck **9** of the offshore installation **1**.

The offshore installation **1** may also comprise a base structure **17**, where the base structure **17** extends at least partly around the moon pool area **7** and below the waterline **8** when the offshore installation **1** is in operation. In an embodiment, the tensioning cylinders **10***a*-**10***h* can, for example, be positioned in the base structure **17** at least partly below the waterline **8**.

Considerable design flexibility is achieved by providing a riser tensioning system according to the present invention, allowing freedom to position the tensioning cylinders **10***a*-**10***h* below a drill floor **5** and/or a deck **9** of an offshore installation **1**, while maintaining various advantages of a direct-acting tensioning or a WLT system. Examples are low complexity, flexibility low friction, high reliability, and low maintenance requirements.

The possibility of locating the tensioning cylinders outside the moon pool area **7** and/or inside the base structure **17** facilitates very short piping for hydraulic fluid, thus reducing load variations due to hydraulic flow resistance. This can be achieved by placing any required accumulators and related hydraulic/pneumatic equipment close to the tensioning cylinders **10***a*-**10***h*.

According to the present invention, the tensioning cylinders can also be placed in areas with strict space restrictions, for example, in a base structure **17** alongside vertical walls

7', while any sheaves used can still be designed with a sufficient size to provide low wear on the wire rope. (This typically means a wire-to-sheave diameter ratio, D/d, of at least 30.) Arranging the tensioning cylinders **10***a*-**10***h* in a position lower than the drill floor **5** and the deck **9** on a floating installation **1** is advantageous in terms of vessel stability and center of gravity, and to free up space for other equipment on the drill floor **5**, deck **9**, and in the moon pool area **7**, where strict space restrictions typically exist.

It should be understood that any of the embodiments of the riser tensioning system **100** according to FIGS. **4** to **7** can be arranged in the offshore installation **1**.

FIG. **9** shows an offshore installation **1** in the form of a semi-submersible vessel where the riser tensioning system **100** according to FIG. **5** is arranged in the semi-submersible vessel. The riser tensioning system **100** is arranged so that the walls **7'** will protect the tensioning cylinders **10***a*-**10***h* and the sheaves **12***a*-**12***h* from seawater exposure, so that the riser tensioning system **100** is less affected by the harsh environment offshore.

FIG. **10** shows a column formed offshore installation **1** where the riser tensioning system **100** is arranged in the columns of the offshore installation **1**.

FIG. **11** shows an alternative embodiment of the riser tensioning system **100** as described in relation to FIG. **4**. In this embodiment, guide elements **70***a* and **70***b* are provided to guide the cylinder rods **60***a* and **60***b*, respectively. Each guide element **70***a* and **70***b* is adapted to guide the respective cylinder rod **60***a* or **60***b* linearly, i.e., along a linear path, in extension of the longitudinal direction of the respective tensioning cylinder **10***a* or **10***b*. The guide elements **70***a* and **70***b* can, for example, support the cylinder rods **60***a* and **60***b* along their full stroke. The guide elements **70***a* and **70***b* provide that the cylinder rods **60***a* and **60***b* are not exposed to excessive bending or transverse (side) forces, particularly in their stroked-out positions, such as the situation shown in FIG. **11**. This is particularly important for long-stroke cylinders which are typically used in many such installations described here (compare FIGS. **8-10**).

The guide elements **70***a* and **70***b* may be in the form of guides or tracks along which the cylinder rods **60***a* and **60***b* are led. The guide elements **70***a* and **70***b* are advantageously fixed on the wall **7'**, thereby allowing the cylinder rots **60***a* and **60***b* to extend parallel to the wall **7'**.

A riser tensioning system according to any of the above embodiments will typically consist of 4, 6, 8 or 10 riser tensioners cylinders **10***a*-**10***h*. The number of riser tensioner cylinders depends on the application and the load requirements.

The cylinder rods **60***a*, **60***b* of the riser tensioning cylinders **10***a*-**10***h* in the riser tensioning system **100** or installation **1** according to the present invention as described above advantageously operate in tension when providing a force for tensioning the wirelines **11***a*-**11***h*. This provides the advantage that long-stroke cylinders can be used, without the risk of bending or side forces, as opposed to cylinders operating in compression.

In the preceding description, various aspects of the apparatus according to the present invention have been described with reference to the illustrative embodiments. For purposes of explanation, specific numbers, systems and configurations are set forth in order to provide a thorough understanding of the apparatus and its workings. This description is not, however, intended to be construed in a limiting sense. Various modifications and variations of the illustrative embodiment, as well as other embodiments of the apparatus, which are apparent to persons skilled in the art to which the disclosed subject matter pertains, are deemed to lie within the scope of the present invention. Reference should also be had to the appended claims.

What is claimed is:

1. A floating installation comprising:

a riser tensioning system for providing a tensioning to a riser connected to the floating installation via a tension ring, the riser tensioning system comprising:

at least one riser tensioner assembly, each of the at least one riser tensioner assembly comprising,

a riser tensioning cylinder comprising a cylinder rod which is configured to work in tension,

at least one sheave, and

a wireline comprising a first end and a second end, the first end being fixed to the tension ring, and the second end being fixed to the cylinder rod, the wireline being configured to extend between the tension ring and the cylinder piston via the at least one sheave;

a moon pool; and

a base structure configured to extend at least partly around the moon pool and below a waterline,

wherein,

the riser tensioning cylinder of the at least one riser tensioner assembly is arranged in the base structure of the floating installation, and

the riser tensioning cylinder is positioned in the base structure at least partly below the waterline.

2. The floating installation as recited in claim **1**, wherein the at least one sheave is, during a use, configured to be pivotable around an axis which is parallel to the riser.

3. The floating installation as recited in claim **1**, wherein,

the wireline comprises a wireline diameter,

at least one of the at least one sheave comprises a sheave diameter, and

a ratio between the wireline diameter and the sheave diameter is at least 30.

4. The floating installation as recited in claim **1**, wherein the at least one riser tensioner assembly comprises 4, 6, 8 or 10 riser tensioner assemblies.

5. The floating installation as recited in claim **1**, further comprising:

a physical boundary that at least partly covers the riser tensioning cylinder of the at least one riser tensioner assembly, the physical boundary being configured to at least partly block any direct exposure of ambient water onto the riser tensioning cylinder during a use.

6. The floating installation as recited in claim **5**, wherein the riser tensioning system further comprises:

at least one guide element configured to guide the cylinder rod in a linear direction.

7. The floating installation as recited in claim **6**, wherein the at least one guide element is fixed to the physical boundary.

8. The floating installation as recited in claim **5**, wherein,

the moon pool comprises walls, and

the physical boundary also comprises the walls of the moon pool.

9. The floating installation as recited in claim **1**, further comprising:

a drill floor; and

a deck,

wherein,

the riser tensioning cylinder of the at least one riser tensioner assembly is arranged below the drill floor and the deck of the floating installation.

10. The floating installation as recited in claim 1, wherein the floating installation is a drilling vessel.

11. A floating installation comprising:

a riser tensioning system for providing a tensioning to a riser connected to a floating installation via a tension ring, the riser tensioning system comprising:

at least one riser tensioner assembly, each of the at least one riser tensioner assembly comprising,

a riser tensioning cylinder comprising a cylinder rod which is configured to work in tension,

at least one first sheave fixed to the cylinder rod,

at least one second sheave, and

a wireline comprising a first end and a second end, the first end being fixed to the tension ring, and the second end being fixed to the floating installation, the wireline being configured to extend between the tension ring and the cylinder piston via at least one of the at least one first sheave and the at least one second sheave;

a moon pool;

a base structure configured to extend at least partly around the moon pool and below a waterline; and

a wall arranged in the base structure above the riser tensioning cylinder, the wall being configured to at least partly cover the riser tensioning cylinder so as to protect the riser tensioning cylinder from exposure to seawater,

wherein,

the riser tensioning cylinder of the at least one riser tensioner assembly is arranged in the base structure of the floating installation, and

the riser tensioning cylinder is positioned in the base structure at least partly below the waterline.

12. The floating installation as recited in claim 11, wherein the at least one second sheave, during a use, is configured to be pivotable around an axis which is parallel to the riser.

13. The floating installation as recited in claim 11, wherein,

the wireline comprises a wireline diameter,

at least one of the at least one first sheave and the at least one second sheave comprises a sheave diameter, and

a ratio between the wireline diameter and the sheave diameter is at least 30.

14. The floating installation system as recited in claim 11, wherein the at least one riser tensioner assembly comprises 4, 6, 8 or 10 riser tensioner assemblies.

15. The floating installation as recited in claim 11, further comprising:

a physical boundary that at least partly covers the riser tensioning cylinder of the at least one riser tensioner assembly, the physical boundary being configured to at least partly block any direct exposure of ambient water onto the riser tensioning cylinder during a use.

16. The floating installation as recited in claim 15, wherein the riser tensioning system further comprises:

at least one guide element configured to guide the cylinder rod in a linear direction.

17. The floating installation as recited in claim 16, wherein the at least one guide element is fixed to the physical boundary.

18. The floating installation as recited in claim 15, wherein,

the moon pool comprises walls, and

the physical boundary also comprises the walls of the moon pool.

19. The floating installation as recited in claim 11, further comprising:

a drill floor; and

a deck,

wherein,

the riser tensioning cylinder of the at least one riser tensioner assembly is arranged below the drill floor and the deck of the floating installation.

20. The floating installation as recited in claim 11, wherein the floating installation is a drilling vessel.

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