

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO	
RAD: 14-97052- -2	FECHA: 2015-05-29 16:24:20
DEP: 2020 DIRECCION DE NUEVAS CREACIONES	EVE: 378 FASE NACIONAL INCLUIDO CAPITULO I
TRA: 11 PCT-PATENTE DE INVENCION CAPITULOS I Y II	FOLIOS: 12
ACT: 519 TRASLADOINFORME	

DIRECCIÓN DE NUEVAS CREACIONES

2020
Bogotá, D.C.,

Abogado(a)/Señor(a)
MARGARITA CASTELLANOS ABONDANO

Asunto: Radicación: 14-97052- -2
Trámite: 11
Evento: 378
Actuación: 519
Oficio: 6035
Folios: 12

Patente de Invención	X			Patente de Modelo de Utilidad	
Vía Nacional					
Vía PCT (Fase Nacional)	X	Capítulo I	X	Capítulo II	
No. Solicitud Internacional	PCT/CN2013/072925				
Fecha de Presentación Internacional	20/03/2013				

Como resultado del examen de fondo realizado, con fundamento en el Artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se comunica:

1. Documentos estudiados

Descripción:	Rad. N° 14-097052-00000-0000	07/mayo/2014
Reivindicaciones:	Rad. N° 14-097052-00000-0000	07/mayo/2014
Dibujos:	Rad. N° 14-097052-00000-0000	07/mayo/2014
Prioridad:	CN 201210074357.5	20/marzo/2012

2. Análisis de la Prioridad

Se acepta la reivindicación de prioridad porque ésta solicitud fue presentada dentro del plazo establecido (Art. 9 D 486) y su contenido técnico corresponde con el de la prioridad reivindicada.

3. Objeto de la invención

De acuerdo con lo establecido en el numeral 1.2.2.2 del Capítulo Primero del Título X de la Circular Única para efectos del examen de patentabilidad, se tendrá en cuenta la tasa pagada por el solicitante al momento de comenzar el examen para las reivindicaciones adicionales; esto es que cuando la solicitud contenga más de diez (10) reivindicaciones y no se haya pagado la tasa complementaria, sólo se estudiarán las cubiertas por la tasa pagada. Por lo tanto, se estudiarán las reivindicaciones 1 a 17.

Título de la solicitud: “Una estructura de bloqueo anti-deslizante y un sillín de cable del puente atirantado que tiene la estructura” (Fl. 1).

El problema planteado en esta solicitud, consiste en lograr una estructura de bloqueo antideslizante que proporcione una fuerza anti-deslizante constante desde la construcción del puente, su etapa de operación e inclusive en momentos posteriores.

Para resolver este problema técnico, la solicitud en estudio propone una estructura de bloqueo anti-deslizante que consta de un barril de protección, un bloque antideslizante dispuesto dentro del barril de protección y un elemento asegurador para bloquear el bloque antideslizante.

El objeto de la presente solicitud se relaciona con la Clasificación Internacional de Patentes (CIP): E 01 D 19/14.

4. De la solicitud de patente

Reivindicaciones (Art 30 D 486, Art 22 PCT)

El capítulo reivindicatorio no es claro porque:

- las expresiones: “...para soportar los cables formados por n filamentos de acero...”, “...para el anti-deslizamiento...”, “...para bloquear el bloque anti-deslizante...” (reivindicación 1), “...para que pasen los filamentos de acero...” (reivindicación 4), “...y está configurado para asegurar y combinar con el filamento de acero (1).” (reivindicación 6); describen funciones, efectos, ventajas o resultados a alcanzar, los cuales no son aspectos susceptibles de patente. Para mayor claridad, el producto reclamado se debe definir técnicamente mediante sus características estructurales. Se sugiere al solicitante eliminar las expresiones citadas.
- Las expresiones: “al menos” o “por lo menos” (reivindicaciones 1, 7 y 13), son imprecisas, por lo cual no permiten distinguir la invención del estado de la técnica. Se sugiere al solicitante eliminar las expresiones citadas.
- No es clara la dependencia de la reivindicación 7 y 13 respecto a las reivindicaciones 1 a 6, toda vez que estas reivindicaciones se refieren a sillines del cable de puente atirantado en donde se disponen las estructuras de bloqueo anti-deslizantes, mas sin embargo estos sillines ya supondrían un objeto diferente a la estructura de bloqueo antideslizante como tal. De acuerdo con lo anterior, estas reivindicaciones deberían ser independientes ya que describen creaciones diferentes. En consecuencia, se sugiere reemplazar las expresiones: “de acuerdo con cualquiera de las reivindicaciones 1-6” y

“ *mencionado anteriormente*” por las características constructivas de la estructura de bloqueo.

- Se presenta un error de transcripción en la reivindicación 13 toda vez que se utiliza el número de referencia (12) para designar al tubo interior. De acuerdo con los dibujos, el número de referencia correcto es (11). Se sugiere al solicitante realizar las correcciones correspondientes.

5. Determinación del Estado de la Técnica

El estado de la técnica se determinó con base en la fecha de presentación de la solicitud de prioridad: marzo 20 de 2012, y se encontraron los siguientes documentos que anticipan el objeto de esta solicitud:

Ítem	Documento	Título	Fecha de Publicación
D1	US 2005/0169702	'End termination means in a tension leg and a coupling for use between such and end termination and connecting point'	04/Agosto/2005
D2	CN201695336	'Cable- stayed bridge rope saddle with anti-slip structure'	05/Enero/2011
D3	CN2658212Y	'Low tower stayed-cable bridge cable saddle ith anti-skid achor'	24/Noviembre/2004
D4	US 6'487.757	'System for connecting a structural cable to a building wotk structure'	03/Diciembre/2002

El documento D1¹ divulga unos medios de terminación para piernas de tensión (10), las cuales están construidas por un número de filamentos (5) que constituyen los elementos que soportan las cargas de las piernas de tensión (10) (resumen).

El documento D2² divulga un una estructura de bloqueo para puentes con una estructura antideslizante, que se compone de unos alambre de acero, con un cilindro protector y una pieza conectora (resumen).

El documento D3³ divulga un sistema de bloqueo para puentes con una estructura antideslizante que incluye un sillín de cable de puente atirantado y dos anclajes anti-deslizantes (resumen).

El documento D4⁴ divulga un sistema de conexión para conectar un cable que incluye por lo menos un alambre para una estructura de construcción y un elemento de la estructura (resumen).

1 <https://docs.google.com/viewer?url=patentimages.storage.googleapis.com/pdfs/US20050169702.pdf>

2 <https://www.google.ca/patents/CN201695336U?cl=en&dq=cn201695336&hl=es&sa=X&ei=XkZZVZuDB7GHsQS1sYGQBQ&ved=0CB0Q6AEwAA>

3 https://www.google.com.co/patents/CN2658212Y?cl=en&dq=CN2658212&hl=en&sa=X&ei=aWFbVcypEZKsNo_ZgTA&ved=0CBsQ6AEwAA

4 <https://docs.google.com/viewer?url=patentimages.storage.googleapis.com/pdfs/US6487757.pdf>

6. Examen de Patentabilidad (Art 14 D486)

Novedad (Art 16 D486)

La reivindicación 1 consiste en: “Una estructura de bloqueo anti-deslizante, configurada para soportar los cables formados por *n* filamentos de acero...” (Ver página 24 del radicado N° 14-097052-00000-0000).

Comparación de las características técnicas esenciales, con las del estado de la técnica:

Características esenciales	D1
Una estructura de bloqueo antideslizante caracterizada por:	Medios de terminación final en una pierna de tensión caracterizados por:
Un barril de protección provisto con una pieza que conecta el barril de protección en un extremo del mismo, en al menos un cilindro hueco.	Una parte de conexión (21) conectada al punto (20) (Fig. 4; Párrs. [0048] y [0049]).
Un bloque anti-deslizante dispuesto dentro del barril de protección.	La parte de conexión (21) recibe el cuerpo (16) (Fig. 4; Párrs. [0048] y [0049]).
Un elemento asegurador.	Una pieza de protección (25) (Fig. 4; Párr. [0051]).
El cilindro hueco se inserta y se fija en al menos una parte de los filamentos de acero de <i>n</i> filamentos de acero con los extremos de los mismos alineados.	Cada filamento (5) se pasa a través de una terminación de camisa (9) (Figs. 4 y 5; Párr. [0041]).
Un extremo del bloque anti-deslizante está en un contacto cercano con una cara del extremo del cilindro hueco.	Un extremo del cuerpo (16) está en un contacto cercano con una cara del extremo de las camisas (9) (Fig. 4).
El bloque antideslizante está provisto de un orificio pasante a través del cual pasan los filamentos de acero.	El cuerpo (16) tiene un numero de aberturas (8) correspondientes al número de filamentos (5) (Figs. 4; Párr. [0036]).

De acuerdo con la tabla anterior, las características esenciales de la estructura de la reivindicación 1 habían sido divulgadas previamente en el documento D1, por lo tanto, la materia reivindicada no es nueva.

Asimismo, el documento D1 divulga las características de las reivindicaciones dependientes así:

- Reivindicación 4: El cuerpo (16) comprende una superficie exterior con medios de conexión, como por ejemplo ranuras anulares (16a) que interactúan con las nervaduras anulares (21a) (Figs. 4; Párr. [0048]).
- Reivindicación 6: Las camisas (9) son cilindros con orificios a través de su interior, en la que dicho orificio tiene la misma forma de sección transversal que el filamento de acero (Fig. 5).

La reivindicación 7 consiste en: “Un sillín de cable del puente atirantado, que comprende

un montaje de tubo individual que está formado por...” (Ver página 25 del radicado N° 14-097052-00000-0000).

Comparación de las características técnicas esenciales, con las del estado de la técnica:

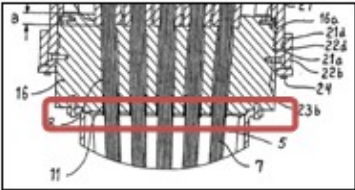
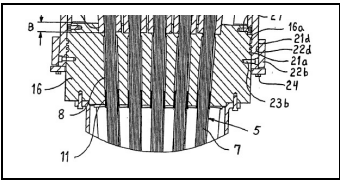
Características esenciales	D1	D2
Un sillín de cable de puente atirantado caracterizado por:	Medios de terminación final en una pierna de tensión caracterizados por:	Cable puentes atirantados con estructura antideslizante caracterizado por:
Un montaje de tubo individual que está formado por x tubos individuales conectados entre si.	Un montaje de tubo individual que está formado por x tubos individuales (5) conectados entre si (Figs. 4 y 5; Párr. [0041]).	Un montaje de tubo individual que está formado por x tubos individuales conectados entre sí (Fig. 1; reivindicación 1).
El montaje con un extremo fijado con una pieza que conecta el tubo individual.	El montaje con un extremo fijado con una pieza que conecta el tubo individual (Figs. 4)	El montaje con un extremo fijado con una pieza que conecta el tubo individual (Figs. 1 y 2).
Una o dos estructuras de bloqueo antideslizantes.	Un cuerpo (16) (Fig. 4; Párrs. [0048] y [0049]).	Una o dos estructuras de bloqueo antideslizantes (Figs. 1 y 2).
La pieza que conecta el barril de protección de la estructura de bloqueo anti-deslizante esta conectada con la pieza que conecta el tubo individual mediante un conector.	La pieza que conecta el cuerpo (16) de la estructura de bloqueo anti-deslizante está conectada con la pieza que conecta el tubo individual mediante un conector (Fig. 4). 	La pieza que conecta el barril de protección de la estructura de bloqueo anti-deslizante está conectada con la pieza que conecta el tubo individual mediante un conector (Figs. 1 y 2).
Un cilindro hueco (9) esta acoplado al tubo individual del montaje de tubo individual.	Un cilindro hueco (9) esta acoplado al tubo individual del montaje de tubo individual (Fig. 4).	Un cilindro hueco (3) esta acoplado al tubo individual del montaje de tubo individual (Figs. 1 y 2; reivindicación 1).

- Reivindicación 11: los conectores son pasadores de conexión, pernos o remaches (D2: Figs. 1 y 2; reivindicación 4).
- Reivindicación 12: el tubo individual esta hecho de acero, plásticos, cauchos o materiales sintéticos (D2: reivindicación 4).

Nivel inventivo (Art18 D486)

La reivindicación 13 consiste en: “*Un sillín de cable del puente atirantado, que comprende un montaje de tubo individual que está formado por...*” (Ver página 25 del radicado N° 14-097052-00000-0000).

Comparación de las características técnicas esenciales, con las del estado de la técnica:

Características esenciales	D1	D3
Un sillín de cable de puente atirantado caracterizado por:	Medios de terminación final en una pierna de tensión caracterizados por:	Sistema de bloqueo para puentes con una estructura antideslizante caracterizado por:
Un tubo exterior, un tubo interior situado dentro del tubo exterior.	No menciona.	Un tubo exterior, un tubo interior situado dentro del tubo exterior (Fig. 2).
Dos placas de separación fijadas en ambos extremos del tubo exterior y el tubo interior. La capa de separación de filamentos que está provista con un orificio individual para pasar los filamentos de acero.	Placas de separación fijadas en ambos extremos del tubo exterior y el tubo interior. La capa de separación de filamentos que está provista con un orificio individual para pasar los filamentos de acero (Fig. 4). 	No menciona.
Una o dos estructuras de bloqueo anti-deslizantes.	Un cuerpo (16) (Fig. 4; Párrs. [0048] y [0049]).	Una o dos estructuras de bloqueo anti-deslizantes (Fig. 1; Reivindicación 1).
La pieza que conecta el barril de protección de la estructura de bloqueo anti-deslizante está conectada con la placa de separación de filamentos mediante un conector.	La pieza que conecta el cuerpo (16) de la estructura de bloqueo anti-deslizante está conectada con la placa de separación de filamentos mediante un conector (Fig. 4). 	No menciona.
Un cilindro hueco acoplado con un orificio individual sobre la placa de separación de filamentos.	Un cilindro hueco (11) acoplado con un orificio individual sobre la placa de separación de filamentos (Fig. 4).	

Los documentos D1 y D3 se consideran el estado de la técnica cercano a la invención definida en la reivindicación 13 porque divulgan medios de terminación final en una pierna de tensión y un sistema de bloqueo para puentes con una estructura antideslizante.

La diferencia entre la invención, definida en la reivindicación 13 y el sistema de D1 consiste en un tubo exterior y un tubo interior situado dentro del tubo exterior.

La diferencia entre la invención, definida en la reivindicación 13 y el sistema de D2 consiste en las placas de separación de filamentos que está provista con un orificio individual para pasar los filamentos de acero.

El efecto que logra el incluir un tubo exterior y un tubo interior situado dentro del tubo exterior es que mejora la protección de los filamentos en su interior.

Por lo tanto, el problema técnico objetivo que pretende resolver esta invención se puede formular así: “cómo modificar el sistema conocido en D1 para mejorar la protección de los filamentos en su interior”.

Sin embargo, un tubo exterior y un tubo interior situado dentro del tubo exterior para mejorar la protección de los filamentos en su interior, ya está divulgada en el documento D3 que se refiere a un tubo exterior, un tubo interior situado dentro del tubo exterior (Fig. 2).

En consecuencia, la persona del oficio normalmente versada en la materia, incluiría un tubo exterior, un tubo interior situado dentro del tubo exterior del documento D3 en el sistema divulgado en el documento D1 para llegar así al objeto de la reivindicación 13 de la solicitud. Por lo cual se considera obvia.

Asimismo, los documentos D1 y D3 divulgan las características de las reivindicaciones dependientes así:

- Reivindicación 15: Hay una estructura de bloqueo anti-deslizante que está conectada a un extremo del tubo exterior y el tubo interior, y los otros extremos del tubo exterior y el tubo interior unidos al manguito de conexión mediante un conector (D3: Fig. 1).
- Reivindicación 16: Dos estructuras de bloqueo anti-deslizante que están conectadas respectivamente a ambos extremos del tubo exterior y el tubo interior (D3: Fig. 1).

Vale la pena agregar, que es bien conocido en la técnica que las juntas pueden tener pasadores de conexión, pernos o remaches⁵. Por lo tanto, la reivindicación 17 no contiene características que puedan dar novedad o nivel inventivo a la creación reclamada.

⁵ MOTT, Robert. Diseño de Elementos de Máquinas. Disponible en: <http://es.scribd.com/doc/146144833/Diseno-de-Elementos-de-Maquinas-4ta-Edicion-Robert-L-Mott-pdf>

En cuanto a la reivindicación 2 se tiene:

Comparación de las características técnicas esenciales, con las del estado de la técnica:

Características esenciales	D1	D4
Una estructura de bloqueo antideslizante caracterizada por:	Medios de terminación final en una pierna de tensión caracterizados por:	Sistema de conexión para conectar un cable caracterizado por:
Un barril de protección provisto con una pieza que conecta el barril de protección en un extremo del mismo, en al menos un cilindro hueco.	Una parte de conexión (21) conectada al punto (20) (Fig. 4; Párrs. [0048] y [0049]).	Un barril de protección (26) provisto con una pieza que conecta el barril de protección en un extremo del mismo, en al menos un cilindro hueco (Fig.4).
Un bloque anti-deslizante dispuesto dentro del barril de protección.	La parte de conexión (21) recibe el cuerpo (16) (Fig. 4; Párrs. [0048] y [0049]).	Un bloque anti-deslizante (12) dispuesto dentro del barril de protección (26) (Fig.4).
Un elemento asegurador.	Una pieza de protección (25) (Fig. 4; Párr. [0051]).	Un elemento asegurador (25) (Fig. 4).
El cilindro hueco se inserta y se fija en al menos una parte de los filamentos de acero de n filamentos de acero con los extremos de los mismos alineados.	Cada filamento (5) se pasa a través de una terminación de camisa (9) (Figs. 4 y 5; Párr. [0041]).	El cilindro hueco (55) se inserta y se fija en al menos una parte de los filamentos de acero de n filamentos de acero con los extremos de los mismos alineados (Figs. 5 y 6).
Un extremo del bloque anti-deslizante está en un contacto cercano con una cara del extremo del cilindro hueco.	Un extremo del cuerpo (16) está en un contacto cercano con una cara del extremo de las camisas (9) (Fig. 4).	No menciona.
El bloque antideslizante está provisto de un orificio pasante a través del cual pasan los filamentos de acero.	El cuerpo (16) tiene un numero de aberturas (8) correspondientes al número de filamentos (5) (Figs. 4; Párr. [0036]).	El bloque antideslizante (12) está provisto de un orificio pasante (20) a través del cual pasan los filamentos de acero (Fig. 4).
El bloque anti-deslizante es un montaje de bloque anti-deslizante que consiste de pequeñas deslizadores con una estructura separada, y el montaje de bloque anti-deslizante como una totalidad tiene una forma cilíndrica con secciones transversales, circular, elíptica, cuadrangular o hexagonal. Cada pequeño deslizador está provisto de una ranura y las ranuras en los pequeños deslizadores están adyacentes entre sí alineadas la una con la otra para encerrar un orificio pasante.	No menciona.	El bloque anti-deslizante (12) es un montaje de bloque anti-deslizante que consiste de pequeñas deslizadores con una estructura separada (15), y el montaje de bloque anti-deslizante como una totalidad tiene una forma cilíndrica con secciones transversales, circular, elíptica, cuadrangular o hexagonal. Cada pequeño deslizador está provisto de una ranura y las ranuras (20) en los pequeños deslizadores están adyacentes entre sí alineadas la una con la otra para encerrar un orificio pasante (Fig. 3).

Los documentos D1 y D4 se consideran el estado de la técnica cercano a la invención definida en las reivindicaciones 1 y 2 porque divulgan medios de terminación final en una pierna de tensión y un sistema de conexión para conectar un cable.

La diferencia entre la invención, definida en las reivindicaciones 1 y 2 y el sistema de D1 consiste en el bloque anti-deslizante, que es un montaje de bloque anti-deslizante que consiste de pequeñas deslizadores con una estructura separada, y el montaje de bloque

anti-deslizante como una totalidad tiene una forma cilíndrica con secciones transversales, circular, elíptica, cuadrangular o hexagonal. Cada pequeño deslizador está provisto de una ranura y las ranuras en los pequeños deslizadores están adyacentes entre sí alineadas la una con la otra para encerrar un orificio pasante.

La diferencia entre la invención, definida en las reivindicaciones 1 y 2 y el sistema de D4 consiste en un extremo del bloque anti-deslizante está en un contacto cercano con una cara del extremo del cilindro hueco.

El efecto que logra el incluir un el bloque anti-deslizante, que es un montaje de bloque anti-deslizante que consiste de pequeñas deslizadores con una estructura separada, y el montaje de bloque anti-deslizante como una totalidad tiene una forma cilíndrica con secciones transversales, circular, elíptica, cuadrangular o hexagonal. Cada pequeño deslizador está provisto de una ranura y las ranuras en los pequeños deslizadores están adyacentes entre sí alineadas la una con la otra para encerrar un orificio pasante, es que evita el deslizamiento de los filamentos dentro del sistema.

Por lo tanto, el problema técnico objetivo que pretende resolver esta invención se puede formular así: “cómo modificar el sistema conocido en D1 para evitar el deslizamiento de los filamentos dentro del sistema”.

Sin embargo, el bloque anti-deslizante, que es un montaje de bloque anti-deslizante que consiste de pequeñas deslizadores con una estructura separada, y el montaje de bloque anti-deslizante como una totalidad tiene una forma cilíndrica con secciones transversales, circular, elíptica, cuadrangular o hexagonal. Cada pequeño deslizador está provisto de una ranura y las ranuras en los pequeños deslizadores están adyacentes entre sí alineadas la una con la otra para encerrar un orificio pasante para para evitar el deslizamiento de los filamentos dentro del sistema, ya está divulgada en el documento D4 que se refiere a El bloque anti-deslizante (12) es un montaje de bloque anti-deslizante que consiste de pequeñas deslizadores con una estructura separada (15), y el montaje de bloque anti-deslizante como una totalidad tiene una forma cilíndrica con secciones transversales, circular, elíptica, cuadrangular o hexagonal. Cada pequeño deslizador está provisto de una ranura y las ranuras (20) en los pequeños deslizadores están adyacentes entre sí alineadas la una con la otra para encerrar un orificio pasante (Fig. 3).

En consecuencia, la persona del oficio normalmente versada en la materia, incluiría El bloque anti-deslizante (12) es un montaje de bloque anti-deslizante que consiste de pequeñas deslizadores con una estructura separada (15), y el montaje de bloque anti-deslizante como una totalidad tiene una forma cilíndrica con secciones transversales, circular, elíptica, cuadrangular o hexagonal. Cada pequeño deslizador está provisto de una ranura y las ranuras (20) en los pequeños deslizadores están adyacentes entre sí alineadas la una con la otra para encerrar un orificio pasante del documento D4 en el sistema divulgado en el documento D1 para llegar así al objeto de las reivindicaciones 1 y 2 de la solicitud. Por lo cual se considera obvia.

Con referencia a la reivindicación 3 se tiene:

Comparación de las características técnicas esenciales, con las del estado de la técnica:

Características esenciales	D1	D2
Una estructura de bloqueo antideslizante caracterizada por:	Medios de terminación final en una pierna de tensión caracterizados por:	Cable puentes atirantados con estructura antideslizante caracterizado por:
Un barril de protección provisto con una pieza que conecta el barril de protección en un extremo del mismo, en al menos un cilindro hueco.	Una parte de conexión (21) conectada al punto (20) (Fig. 4; Párrs. [0048] y [0049]).	Un barril de protección (2) provisto con una pieza que conecta el barril de protección en un extremo del mismo, en al menos un cilindro hueco (Figs. 1 y 2).
Un bloque anti-deslizante dispuesto dentro del barril de protección.	La parte de conexión (21) recibe el cuerpo (16) (Fig. 4; Párrs. [0048] y [0049]).	Un bloque anti-deslizante dispuesto dentro del barril de protección (Figs.1 y 2).
Un elemento asegurador.	Una pieza de protección (25) (Fig. 4; Párr. [0051]).	No menciona.
El cilindro hueco se inserta y se fija en al menos una parte de los filamentos de acero de n filamentos de acero con los extremos de los mismos alineados.	Cada filamento (5) se pasa a través de una terminación de camisa (9) (Figs. 4 y 5; Párr. [0041]).	El cilindro hueco (3) se inserta y se fija en al menos una parte de los filamentos de acero (5) de n filamentos de acero con los extremos de los mismos alineados (Reivindicación 1).
Un extremo del bloque anti-deslizante está en un contacto cercano con una cara del extremo del cilindro hueco.	Un extremo del cuerpo (16) está en un contacto cercano con una cara del extremo de las camisas (9) (Fig. 4).	Un extremo del bloque anti-deslizante está en un contacto cercano con una cara del extremo del cilindro hueco (3) (Figs.1 y 2).
El bloque antideslizante está provisto de un orificio pasante a través del cual pasan los filamentos de acero.	El cuerpo (16) tiene un numero de aberturas (8) correspondientes al número de filamentos (5) (Figs. 4; Párr. [0036]).	No menciona.
Varios cordoncillos de refuerzo en el exterior del barril de protección.	No menciona.	Varios cordoncillos de refuerzo (7) en el exterior del barril de protección (Figs.1 y 2).

Los documentos D1 y D2 se consideran el estado de la técnica cercano a la invención definida en las reivindicaciones 1 y 3 porque divulgan medios de terminación final en una pierna de tensión y un cable puentes atirantados con estructura antideslizante.

La diferencia entre la invención, definida las reivindicaciones 1 y 3 y el sistema de D1 consiste en Varios cordoncillos de refuerzo en el exterior del barril de protección.

La diferencia entre la invención, definida en las reivindicaciones 1 y 3 y el cable de D4 consiste en un elemento asegurador y un bloque anti-deslizante está provisto de un orificio pasante a través del cual pasan los filamentos de acero.

El efecto que logra el incluir los varios cordoncillos de refuerzo en el exterior del barril de protección, es refuerza la estructura de bloqueo antideslizante.

Por lo tanto, el problema técnico objetivo que pretende resolver esta invención se puede formular así: “cómo modificar el sistema conocido en D1 para reforzar la estructura de bloqueo antideslizante”.

Sin embargo, los varios cordoncillos de refuerzo en el exterior del barril de protección para

reforzar la estructura de bloqueo antideslizante, ya está divulgada en el documento D2 que se refiere Varios cordoncillos de refuerzo (7) en el exterior del barril de protección (Figs.1 y 2).

En consecuencia, la persona del oficio normalmente versada en la materia, incluiría los varios cordoncillos de refuerzo en el exterior del barril de protección del documento D2 en el sistema divulgado en el documento D1 para llegar así al objeto de las reivindicaciones 1 y 3 de la solicitud. Por lo cual se considera obvia.

Las reivindicaciones 7 y 13 fueron afectadas en el numeral 4 de la presente comunicación.

7. Conclusión

Los requisitos de Patentabilidad de la presente solicitud están afectados así:

Ítem	Documento	Reivindicaciones afectadas	Requisito que afecta
D1	US 2005/0169702	1 a 4, 6, 7, 13	Novedad/Nivel Inventivo
D2	CN201695336	3, 7, 9, 12	Novedad/Nivel Inventivo
D3	CN2658212Y	13, 15, 16	Nivel inventivo
D4	US 6'487.757	2	Nivel inventivo

En cumplimiento del artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le indica que debe dar respuesta dentro del término de sesenta (60) días contados a partir del día siguiente de la fecha de notificación de la presente comunicación. En caso de no dar respuesta al presente requerimiento, o si a pesar de la respuesta subsistieran los impedimentos para la concesión, se denegará la patente.

Se invita al solicitante se sirva indicar, si así lo considera, su renuncia al término faltante de sesenta (60) días para dar respuesta a este requerimiento y presentarla por escrito.

Finalmente, se le recuerda al solicitante que si como respuesta a este requerimiento llegara a modificar el capítulo reivindicatorio y éste contenga más de diez (10) reivindicaciones, no pagará la tasa de modificación voluntaria pero sí la correspondiente al pago por reivindicación adicional.

Notifíquese el presente oficio conforme a lo dispuesto en el numeral 5.2, literal e), del capítulo quinto del título primero de la Circular Única No. 10 de 2001.


JESUS FERNEL GARCÍA GARCÍA
Director de Nuevas Creaciones (E)

El anterior requerimiento fue notificado por fijación en lista, de fecha 2015-06-02

Elaboró: Monica Andrea Gutierrez Almonacid
Revisó: Sonia Andrea Diaz Pirazan



US 20050169702A1

(19) **United States**(12) **Patent Application Publication** (10) **Pub. No.: US 2005/0169702 A1****Paulshus**(43) **Pub. Date: Aug. 4, 2005**

(54) **END TERMINATION MEANS IN A TENSION
LEG AND A COUPLING FOR USE BETWEEN
SUCH AN END TERMINATION AND
CONNECTING POINT**

Publication Classification(51) **Int. Cl.⁷** **F16D 1/00**(52) **U.S. Cl.** **403/300**(76) **Inventor: Bjorn Paulshus, Skedsmokorset (NO)**(57) **ABSTRACT**

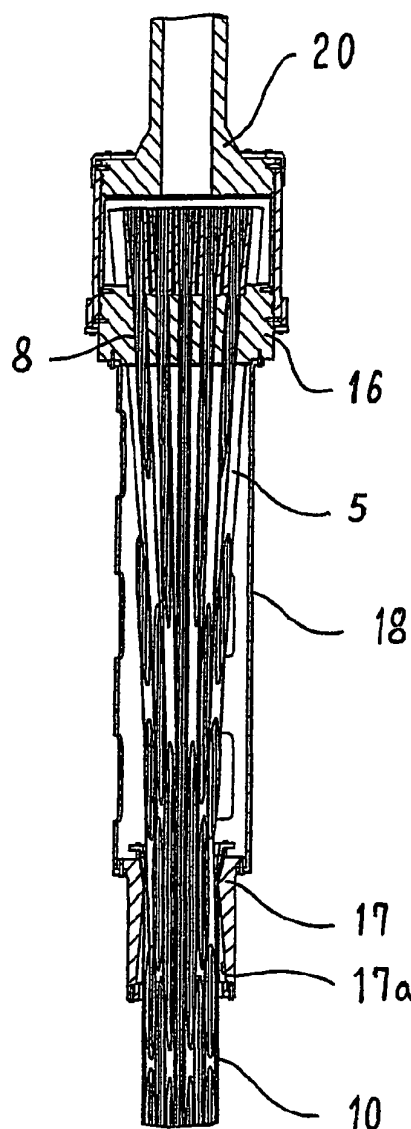
Correspondence Address:

**BIRCH STEWART KOLASCH & BIRCH
PO BOX 747
FALLS CHURCH, VA 22040-0747 (US)**

(21) **Appl. No.: 10/501,482**(22) **PCT Filed: Jan. 22, 2003**(86) **PCT No.: PCT/NO03/00019**(30) **Foreign Application Priority Data**

Jan. 25, 2002 (NO) 20020406

An end termination means for tension legs (10) of non-metallic materials like composite material is disclosed. The tension leg (10) is constructed of a number of strands (5) that constitute the load carrying elements of the tension leg (10). The strands (5) are twisted (laid) about the longitudinal axis of the tension leg (10) by a predetermined laying length and each strand (5) is in turn constructed of a plurality of rods (7) of composite material having embedded strength fibers. The rods (7) are in turn twisted about each other like in a wire rope. The strands (5) terminate near a receiving body (16) having connecting means and a number of through-going apertures enclosing the respective strands. Each strand (5) is passed through respective aperture (8) in the receiving body (16) without being fixed therein.



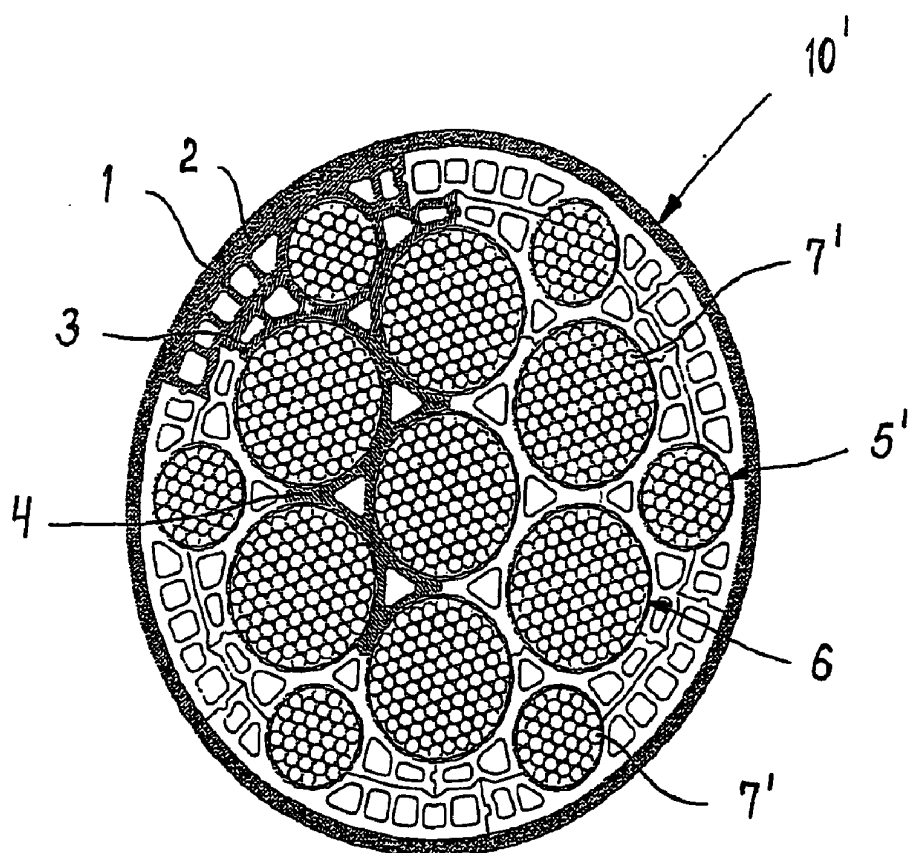


Fig.1.

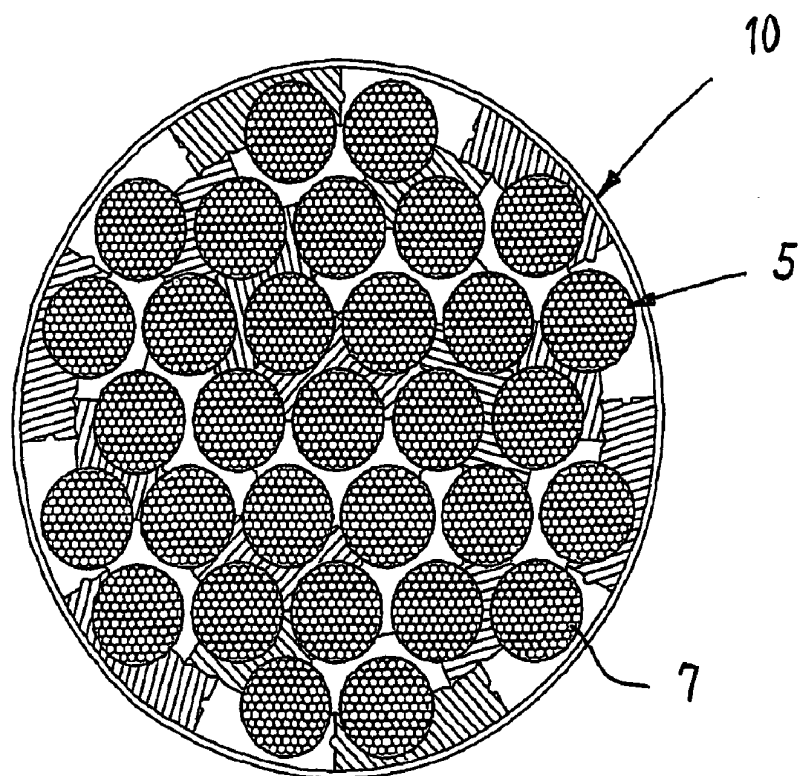


Fig.6.

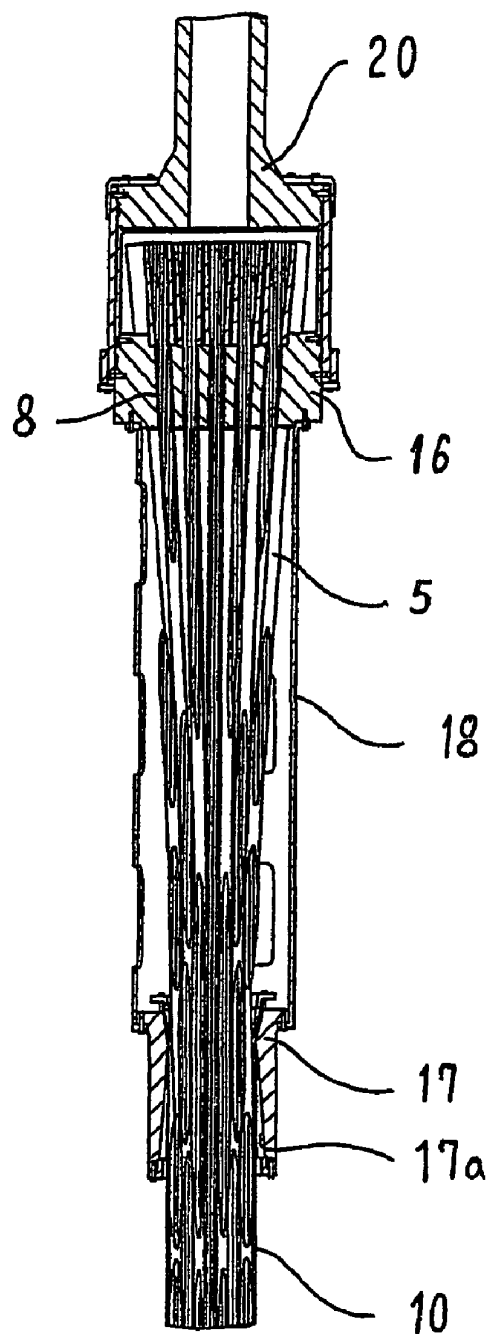
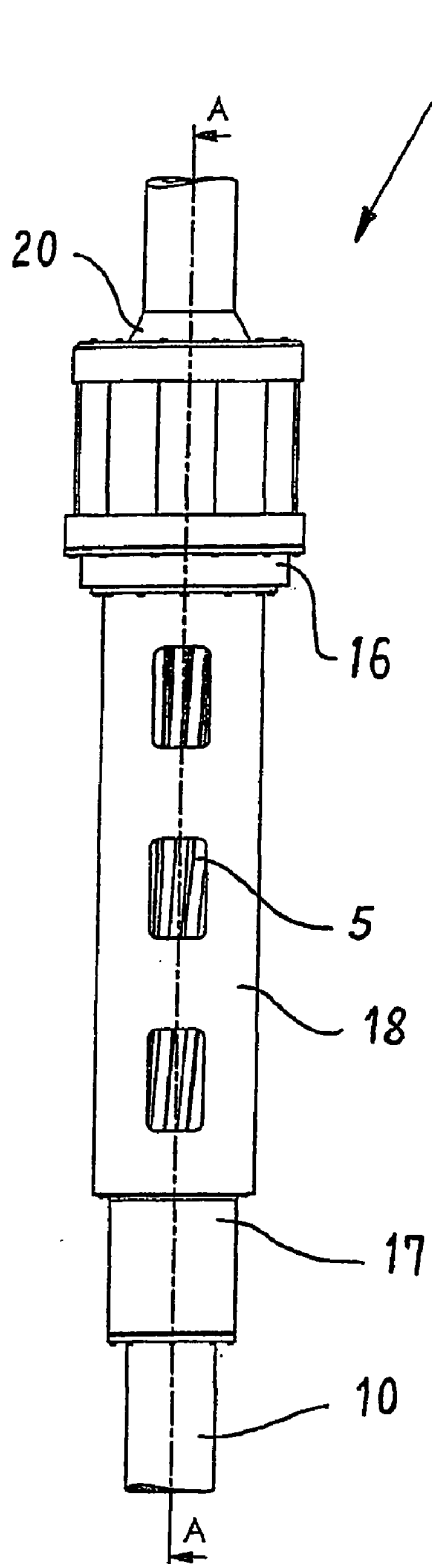


Fig.2.

Fig.3.

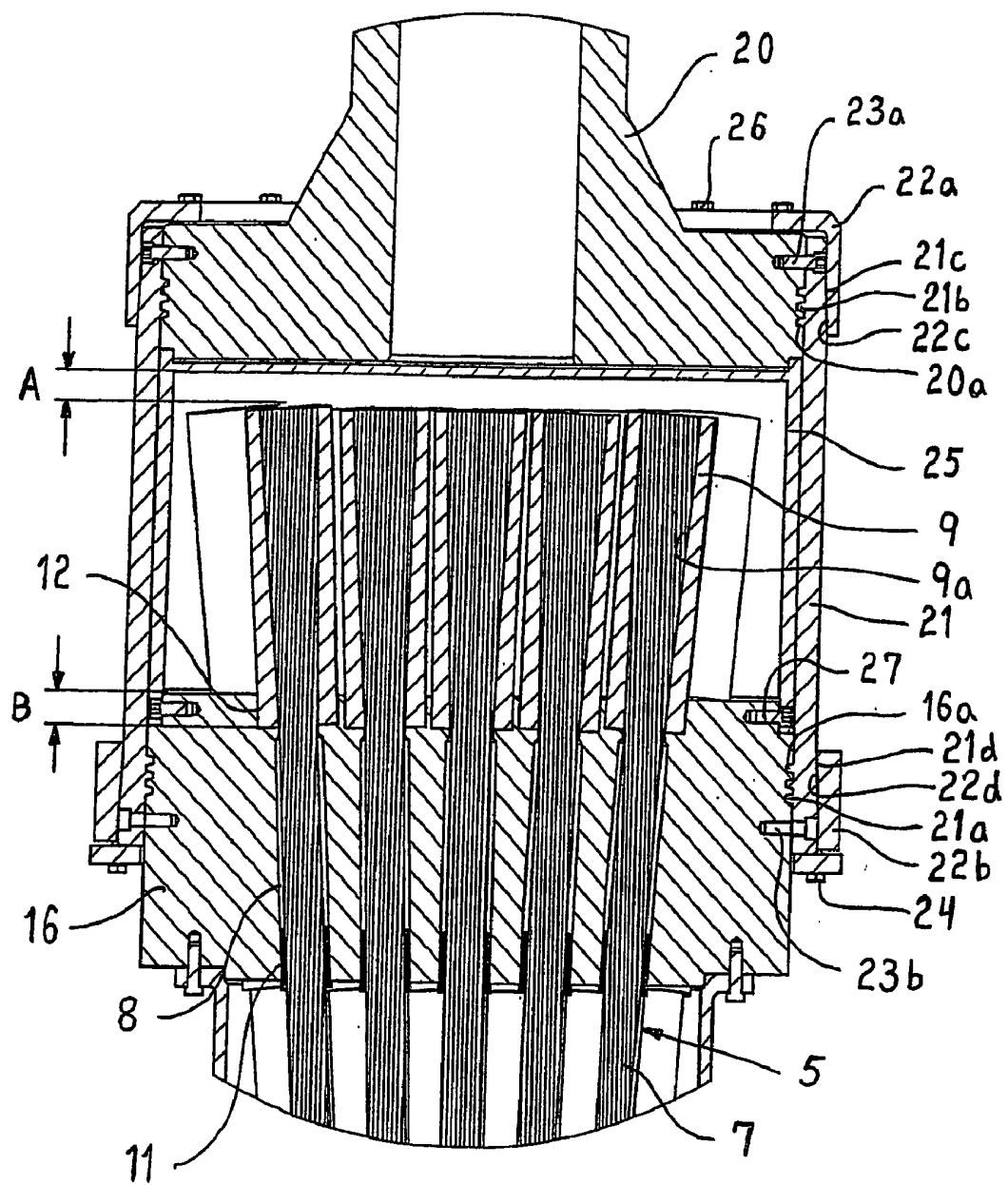


Fig.4.

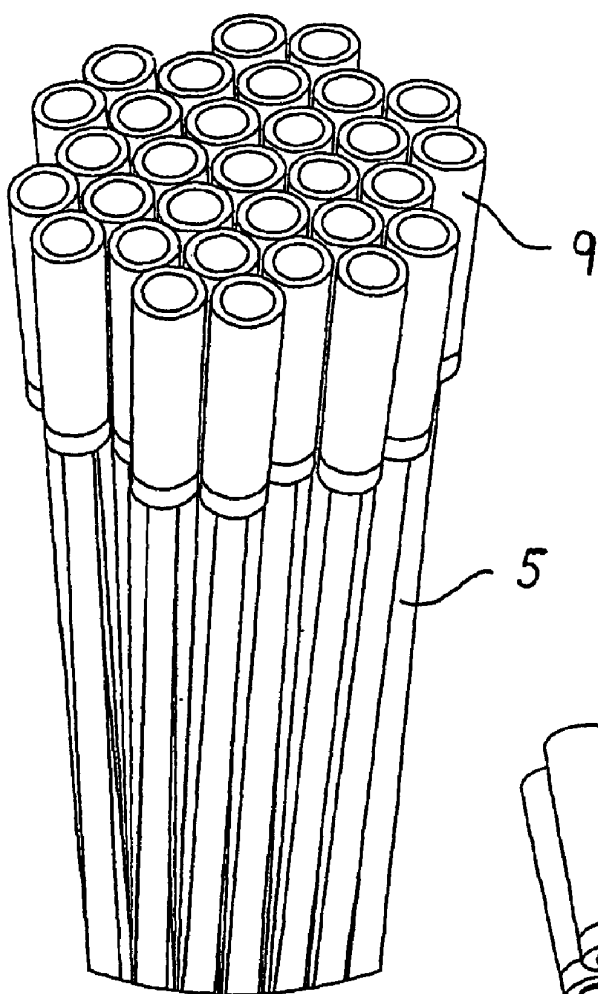


Fig.5A.

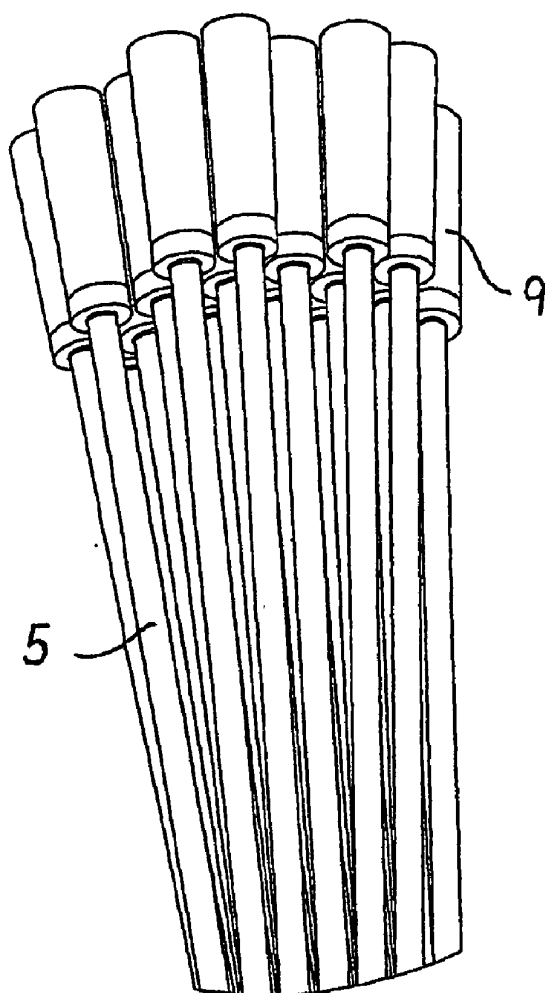


Fig.5B.

END TERMINATION MEANS IN A TENSION LEG AND A COUPLING FOR USE BETWEEN SUCH AN END TERMINATION AND CONNECTING POINT

[0001] The present invention relates to an end termination means for tension legs of non-metallic materials like composite material, which tension leg is constructed of a number of strands that constitute the load carrying elements of the tension leg, which strands are twisted (laid) about the longitudinal axis of the tension leg by a predetermined laying length and each strand is in turn constructed of a plurality of rods of composite material having embedded strength fibres where the rods are twisted about each other like in a wire rope, and the strands terminate near a receiving body having connecting means and a number of through-going apertures enclosing the respective strands.

[0002] Tension legs of the above described nature are known from NO 20002812. An end termination means is known from NO 20002811. An end termination means is also described in WO 02/057560 with the same applicant as to the present invention.

[0003] The end termination according to the invention is in particular developed in view of tension legs that anchor a tension leg platform. Other uses, however, are also of interest, e.i. vertical stays of suspension bridges and similar stays that need to be able to transfer heavy axial forces/loads.

[0004] The advantages with tension legs of composite material is low weight, great load carrying capacity in regard of weight/volume, substantially less prone for fatigue, which means that there is no need for bending restrictors, in addition to be very competitive regarding price/cost. Moreover they have the excellent quality of being able to be coiled onto reels having diameter down to 4 meters.

[0005] Tension legs of steel find their limitation in regard of longitudinal extension, i.e. depths of the ocean, because tension legs are designed as tubulars or pipes in order to reduce the weight in water, preferably so that the tension legs become next to "weightless" when submerged in water. At greater depths it is necessary to increase the wall thickness to avoid buckling due to the external water pressure.

[0006] The later solutions with tension legs of composite material are also considered used when an existing tension leg platform, which is anchored by tethers of steel, is to be transferred to deeper waters. The steel tethers can then be cut off and replaced with tension legs of composite material.

[0007] Of particular concern when composite material is used to transfer forces in load carrying elements, is that the main stresses extend axially within the load carrying elements and that shear stresses should hardly appear.

[0008] With the solution shown in NO 20006643 each strand terminates within a receiving body. In order to fix the strands in a secure manner within the receiving body, it was proposed to make conical inclined apertures in the receiving body. It has now been recognised that the working process for making such apertures are very complicated and expensive.

[0009] Additionally, it has been a desire to provide a certain degree of motional freedom to the terminating area of the strands. During reeling of the tension leg, primarily for transportation purposes, a mutual displacement between

the strands will take place. This results in that some of the strands tend to be retracted into the tension leg, while others will be pushed out at the end termination. This may provide undue compression stress within the composite material for those strands being pushed out if this motion is prevented.

[0010] It is also desired with a certain motional freedom with regard to direction. This is substantiated from the dynamic loading that the tension legs are exposed to when installed. During altering tensile stresses in the tension leg, the tension leg tends to twist about its own longitudinal axis. Thus each individual strand tends to change direction, though it is to be understood that we speak of small angular deviations.

[0011] According to the present invention the above mentioned conditions are taken care of by a means of the introductorily described type, which is distinguished by that each strand is passed through respective aperture in the receiving body without being fixed therein, that each strand has a free end terminating some distance above the receiving body, and that the free end of each strand is fixed to and enclosed by a terminating sleeve having a diameter larger than a corresponding aperture in the receiving body, which terminating sleeve is loosely resting on or abutting the receiving body.

[0012] In order to obtain secure anchoring of the strands, the terminating sleeve is preferably internally tapered in a direction towards the receiving body.

[0013] In order to take care of the motion of the individual strands within the receiving body, a guiding sleeve is suitably arranged in each aperture of the receiving body. Preferably the guiding sleeve is shorter than the length of the aperture in the receiving body. In a preferable embodiment, each guiding sleeve is provided near the entry of the strand into an aperture of the receiving body.

[0014] In order that the terminating sleeve is to return to the same resting surface on the receiving body, each aperture through the receiving body may preferably terminate in a concentric recess for receipt of and to act as a guide and seat for the terminating sleeve.

[0015] In a preferable embodiment the end termination means may include an embracing element that is spaced apart from the receiving body and keeps the strands together. Between the embracing element and the receiving body the strands extend less radial restriction and in a substantially natural direction towards and into the apertures of the receiving body.

[0016] By "natural direction" is the following meant. Up to the embracing element the tension leg extends as a compact string having twisted (laid) strands that are kept together by means of an outer sheath. From the embracing element and further up to the receiving body, the outer sheath is removed. If one temporarily disregards the receiving body, the strands will, when passing out from the embracing element, adopt a natural direction. This natural direction implies that the twisted configuration discontinues and transforms into a rectilinear configuration. The direction of each individual strand, however, will extend obliquely with respect to the longitudinal axis of the tension leg. Expressed in a different way, the strands continue toward the receiving body by a direction extending tangential to helical line of the strands in the tension leg. And, to be noticed, in

addition to this oblique direction, the strands will moreover simultaneously diverge from the longitudinal axis of the tension leg. This direction of the strands is adopted quite natural as a consequence to that the restriction ceases at a particular place.

[0017] This recognition was exploited to avoid the introduction of shear stresses in the stands. The apertures in the receiving body are placed at such radial distance from the longitudinal axis of the tension leg that they correspond with the divergence of the strands at the same time as they are adapted to their inclined direction and rotational orientation.

[0018] Examples of embedded strength fibres that can be used as rods in the strands are fibres of carbon, kevlar, glass or aramid.

[0019] In a preferable embodiment the apertures in the receiving body can be somewhat inclined relative to the longitudinal axis of the tension leg, and preferably the inclination corresponds with the natural direction of the strands between the embracing element and the terminating sleeves.

[0020] The end termination may preferably include an external rigid sleeve that is fixed in one end thereof to the receiving body and in the other end to the embracing element.

[0021] For further connection, the receiving body can have at least one annular groove provided on the outer surface thereof for engagement with at least one first annular rib on a connecting part interconnected to an anchor point.

[0022] Further the anchor point can have at least one external annular groove for engagement with at least one second annular rib provided on the connecting part a distance apart from the at least one first rib, which connecting part is radially fixed by a surrounding connecting part.

[0023] According to the present invention, also a coupling for use between an end termination and an anchor point as described above is provided, which coupling is distinguished in that the radially outer surface of the connecting part has an upwards directed conical form and the radially inner surface of the surrounding connecting part has a complementary conical form.

[0024] Conveniently the connecting part can include pin bolts for temporary fixation of the connecting part to the anchor point.

[0025] Other and further objects, features and advantages will appear from the following description of one for the time being preferred embodiment of the invention, which is given for the purpose of description, without thereby being limiting, and given in context with the appended drawings where:

[0026] FIG. 1 shows a cross sectional view of a typical tension leg for use with the present invention,

[0027] FIG. 2 shows a side elevation view of the end termination according to the invention,

[0028] FIG. 3 shows longitudinal sectional view of the end termination along line A-A in FIG. 2,

[0029] FIG. 4 shows in closer detail an end termination means according to the invention,

[0030] FIG. 5A shows in detail from above, how the strands in the tension leg terminate within the end termination means when free-standing,

[0031] FIG. 5B shows in detail, from below, how the strands in the tension leg terminate within the end termination means when free-standing, and

[0032] FIG. 6 shows another sectional view of a tension leg for use with the present invention.

[0033] Reference is first made to FIG. 1 that illustrates an example of how a tension leg 10' of this nature normally is constructed. The tension leg 10' has an enclosing and gathering sheath 1 of a heavy duty and resistant material, such as polyethylene. Spacer elements in form of different profiles in several layers are arranged within the sheath 1, first an outer profile 2, next an intermediate profile 3 and then an inner profile 4. These profiles have no load carrying properties and only act as spacing elements. They may, as an example, be manufactured of PVC. The profiles 2, 3, 4 create between them cavities that receive respective strands 5', 6, which are the load carrying elements in the tension leg 10'. Each strand 5', 6 is in turn constructed of a number of rods 7', which are manufactured of a composite material having embedded strength fibres. The figure shows strands 5', 6 of different dimensions. Each of the seven strands 5' is made up of 85 rods 7' and each of the six strands 6 is made up of 31 rods 7'.

[0034] It is the individual rods 7' within the stands 5', 6 that transfer the forces/loads within the tension leg 10'. The embedded strength fibres may be fibres of carbon, kevlar, glass or aramid.

[0035] Reference is now made to FIG. 6 that illustrates a second embodiment of a tension leg 10 that is in particular developed for use with the present end termination 15. Here, all the strands 5 are of same dimension and the tension leg 10 is constructed as a bundle consisting of 31 strands 5. In addition, and as usual, spacer elements are provided between the strands 5. Each strand 5 is made up of 85 rods 7, which in turn constitute the individual load-carrying elements. This circumstance that all the strands 5 have the same dimension and construction simplifies the design of the end termination 15 and the assembly thereof. The further description of FIG. 24 refers to a tension leg 10 according to FIG. 6, though the invention can easily be adapted and used for the tension leg of FIG. 1.

[0036] FIGS. 2 and 3 show the end termination 15 of the tension leg 10. The end termination 15 is designed for connection to either an anchorage point 20 on a tension leg platform or similar on the seabed. The end termination 15 comprises a terminating receiving body 16 having external connecting means for connection to the anchorage point 20. The receiving body 16 is in the form of a heavy plate having substantial thickness. A number of apertures 8 corresponding to the number of strands 5 are drilled substantially in axial direction through the receiving body 16. The strands 5 are passed into and partially through the receiving body 16 and terminate here. How the strands 5 interact with the receiving body 16 will be more fully described with relation to FIG. 4.

[0037] At the opposite end of the end termination 15 and spaced apart from the receiving body 16, an embracing element 17 is provided. The embracing element 17 is in the

form of a gathering sleeve that embraces and collects the strands **5** of the tension leg **10**. Between the embracing element **17** and the receiving body **16**, an outer sleeve **18** is arranged. The outer sleeve **18** connects the embracing element **17** and the receiving body **16** to a bending stiff and rotary stiff unit.

[0038] In the entire longitudinal extension of the tension leg **10** the strands **5** are twisted (laid) by a predetermined laying length about the longitudinal axis of the tension leg **10**. By "laying length" is meant the number of revolutions about the longitudinal axis per length unit. For the illustrated tension leg **10** typical values will be like one revolution per 8 meters. The individual rods **7** within each strand **5** are in turn twisted about the longitudinal axis of the strand **5** in the same way as in a wire rope. The laying length for the rods **7** is typically 4 meters.

[0039] The embracing element **17** has an internal surface **17a** formed as a flared funnel facing towards the tension leg **10** proper. The internal surface **17a** may have a radius of curvature of 10 meters as an example. It can be larger or smaller depending on the detail of construction. This curvature shall provide for that the tension leg **10** receives a controlled bending against the internal surface **17a** of the embracing element **17** if the tension leg **10** is exposed to a lateral force. Such a lateral force will always arise because a flexible element in the tension leg connector proper is attempting to prevent lateral motion when the tension leg **10** adopts an inclined position during lateral displacement of the platform.

[0040] When the individual strands **5** pass out of the embracing element **17** in a direction toward the receiving body **16**, the strands **5** will be without any radial restriction and adopt a substantially natural direction toward and into the apertures **8** in the receiving body **16**. This natural direction implies that the twisted configuration of the strands **5** ceases and transforms to a rectilinear configuration. However, the direction of each strand **5** will extend obliquely to the longitudinal axis of the tension leg **10**. Said in a different way, the strands **5** extend toward the receiving body **16** by a direction that extends tangential to the helical line of the strands **5** in the tension leg **10**. And, to be noticed, in addition to this oblique direction, the strands **5** will simultaneously diverge from the longitudinal axis of the tension leg **10**. This direction of the strands **5** is quite naturally adopted as a consequence of that the gathering and twisting cease at the exit from the embracing element **17**.

[0041] Reference is now made to FIG. 4. The receiving body **16** has as mentioned a number of apertures **8**, corresponding to the number of strands **5** drilled or formed substantially axially therethrough. Each strand **5** is passed through respective aperture **8** and one terminating sleeve **9**, with a diameter larger than a corresponding aperture **8** in the receiving body **16**, encloses and is fixed to the free end of the strand **5**. The terminating sleeve **9** will normally be formed with an internal through-going hole **9a** and the lower end thereof abuts the receiving body **16**. Each terminating sleeve **9** rests loosely on the receiving body **16** when the tension leg **10** is not loaded. With advantage are respective recesses **12** formed in the receiving body **16** and are concentric to the respective apertures **8** of the body **16**. Thus it is to be understood that the recesses **12** form guides and seats for the terminating sleeves **9** when the strands **5** are loaded.

[0042] As introductorily mentioned, during reeling of the tension leg **10** (for transportation purposes) a mutual displacement between the strands **5** will take place. This leads to that some of the strands **5** at the end termination tend to be pulled into the tension leg **10**, while others are pushed out. As mentioned, this may provide undue compression stresses within the composite material for those strands **5** that are pushed out if this motion is prevented. This is solved in that the termination sleeves **9** are enabled to be displaced a distance **A** out of the receiving body **16**. The distance **A** is selected somewhat longer than expected actual displacement of the strands **5** during reeling. The recesses **12** have a depth **B** that is chosen to be longer than the distance **A**. This because the terminating sleeves **9** shall not be able to be displaced completely out of the recesses **12** and in such a way that they are guided back to abutment in same seat when the strands **5** are loaded.

[0043] The final fixation of the strands **5** to the respective terminating sleeves **9** is typically made by gluing, i.e. that a liquid epoxy is poured into the holes **9a** and around the strands **5** and are set to cure. The holes **9a** may have any suitable form and will normally be tapered downwards, preferably conical or substantially conical. An assumed in particular favourable form of the holes **9a** will be a downward directed progressive taper, i.e. that the longitudinal sectional profile of a hole **9a** describes a (slight) curve or has a radius. During load the cured epoxy cone having the embedded strand ends are pulled further into the conical holes **9a**. A high hydrostatic pressure is created which further locks the strands **5** against slipping out of the sleeves **9**.

[0044] The individual rods **7** in a strand **5** can conveniently, when they enter into a hole **9a** in the terminating sleeve **9**, be let loose so that they spread out, though modest, in this area. Thus the liquid epoxy will also fill out the space between the spread out rods **7** and the wedging action and the fixation within the conical holes **9a** will be further improved.

[0045] Since the rods **7** are moulded or glued fixedly into the terminating sleeve **9**, the transition between glued and not glued area is very vulnerable to lateral forces. In order to remedy this situation, guiding sleeves **11** for the strands **5** are provided in each aperture **8** in the receiving body **16**. Thus the receiving body **16** also acts as a collecting element and replaces per se the gland **19** of the NO 20006643 reference. The length of the guiding sleeves **11** can vary and be adapted to the different applications.

[0046] The receiving body **16** including the guiding sleeves **11** are accurately positioned with respect to the embracing element **17** by means of fixation to the outer sleeve **18**. Thus it is to be understood that the sleeve **18** locks the receiving body **16** and the embracing element **17** in mutual fixed position. This contributes to that the strands **5** arrive straight into the apertures **8**, more precisely the guiding sleeves **11**, in the receiving body **16** and pass further on straight into the holes **9a** in the terminating sleeves **9**. Lateral forces in the vulnerable area where the glue terminates is avoided. An angular deviation of 1°, as example, where the strands **5** enter into the guiding sleeve **11** can be anticipated. The holes **9a** in the guiding sleeves **11** will thus preferably be designed as a flared funnel facing towards the embracing element **17** and has a typical radius of curvature of approx. 10 meters. This implies that a controlled bending load in the strands **5** is achieved.

[0047] With advantage the apertures 8 in the receiving body 16 can be somewhat inclined relative to the longitudinal axis of the tension leg 10, and this inclined position must then correspond with that direction the strands 5 have towards the receiving body 16.

[0048] FIG. 4 also shows in closer detail a coupling for use between the end termination 15 and a connecting point 20 (anchor point). The receiving body 16 has on the outer surface thereof connecting means, here as an example shown in the form of three annular grooves 16a for interaction with three first annular ribs 21a on a connecting part 21 connected to the connecting point 20.

[0049] The connecting part 21 can be made up of two, three, four or more segments that surround the receiving body 16 and the connecting point 20. Correspondingly the connecting point 20 has three external annular grooves 20a for engagement with three second annular ribs 21b provided on the connecting part 21 at a distance apart from the three first ribs 21a, the segmented connecting part 21 being radially fixed by an upper and lower surrounding, continuous connecting part 22a, 22b.

[0050] An upper radially outer surface 21c on the connecting part 21 has an upward directed conical form and a radially inner surface 22c on the surrounding upper connecting part 22a has a complementary conical form. A lower radially outer surface 21d on the connecting part 21 has an upward directed conical form and a radially inner surface 22d on the surrounding lower connecting part 22b has a complementary conical form. The connecting part 21 may include respective upper and lower pin bolts 23a, 23b for temporary fixation of the individual segments of the connecting part 21 to the connecting point 20 and the receiving body 16 respectively.

[0051] Further, a mechanical protective cap 25 is arranged over and around the terminating sleeves 9. The cap is fixed to the receiving body 16 by means of a number of threaded connections 27.

[0052] During assembly of the connector the receiving body 16, including installed cap 25, is firstly placed against the connecting point 20. Then the individual segments of the connecting part 21 are brought against the receiving body 16 and the connecting point 20 such that the ribs 21a and 21b on the connecting part 21 engage the grooves 16a and 20a on the receiving body 16 and the connecting point 20 respectively. Each segment of the connecting part 21 is secured by the respective pin bolts 23a, 23b to the connecting point 20 and the receiving body 16.

[0053] Then the lower surrounding connecting part 22b is placed over the connecting part 21 so that their respective conical surfaces 21d, 22d touch each other. Next, the lower surrounding connecting part 22b is axially tightened by means of a number of bolts 24 that are circumferentially positioned around the lower surface of the lower connecting part 22b. The bolts 24 extend upward into threaded holes in the lower surrounding connecting part 22b. Tightening of the bolts 24 cause wedging action between the conical surface 22d of the lower surrounding connecting part 22b and the lower conical surface 21d of the connecting part 21. Thus the connecting part 21 having the ribs 21a is urged to secure fixed engagement with the grooves 16a in the receiving body 16 and forms a fixed connection therebetween.

[0054] Next, the upper surrounding connecting part 22a is put over the connecting part 21 such that their respective conical surfaces 21c, 22c touch each other. Similar to the lower connecting part 22b, the tightening of an upper set of bolts 26 will cause wedging action between the conical surface 22c of the surrounding connecting part 22a and the conical surface 21c of the connecting part 21. Thus the connecting part 21 having the ribs 21b is urged to secure fixed engagement with the grooves 20a of the connecting point 20 and forms a fixed connection therebetween.

[0055] FIGS. 5A and 5B illustrate, viewed from above and below, the end termination of a bundle of strands 5 having respective terminating sleeves 9 as it appears when free standing, i.e. without the receiving body 16 installed.

1. An end termination means for tension legs (10; 10') of non-metallic materials like composite material, which tension leg (10; 10') is constructed of a number of strands (5;5', 6) that constitute the load carrying elements of the tension leg (10; 10'), which strands (5;5', 6) are twisted (laid) about the longitudinal axis of the tension leg (10; 10') by a predetermined laying length and each strand (5;5', 6) is in turn constructed of a plurality of rods (7;7') of composite material having embedded strength fibres where the rods (7;7') are twisted about each other like in a wire rope, and the strands (5;5', 6) terminate near a receiving body (16) having connecting means and a number of through-going apertures enclosing the respective strands, characterized in that each strand (5;5', 6) is passed through respective aperture (8) in the receiving body (16) without being fixed therein, that each strand (5;5', 6) has a free end terminating some distance above the receiving body (16), and that the free end of each strand (5;5', 6) is fixed to and enclosed by a terminating sleeve (9) having a diameter larger than a corresponding aperture (8) in the receiving body (16), which terminating sleeve (9) is loosely resting on or abutting the receiving body (16).

2. The end termination means according to claim 1, characterised in that the terminating sleeve (9) is internally tapered in a direction towards the receiving body (16).

3. The end termination means according to claim 1 or 2, characterised in that a guiding sleeve (11) is arranged within each aperture (8) of the receiving body (16).

4. The end termination means according to claim 3, characterised in that the guiding sleeve (11) is shorter than the length of the aperture (8) of the receiving body (16).

5. The end termination means according to claim 4, characterised in that the guiding sleeve (11) is arranged within the aperture (8) close to the entrance of the strands (5;5', 6) into the receiving body (16).

6. The end termination means according to 1, characterised in that each aperture (8) through the receiving body (16) terminates in a concentric recess (12) for receipt of and to act as a guide and seat for the terminating sleeve (9).

7. The end termination means according to claim 6, characterized in that each recess (12) has a depth (B) that is longer than the distance (A) that a terminating sleeve (9) is able to move out of the receiving body (16).

8. The end termination means according to 1, characterised in that the end termination (15) comprises an embracing element (17) that is spaced apart from the receiving body (16) and keeps the strands (5;5', 6) together, that between the embracing element (17) and the receiving body (16) the strands (5;5', 6) extend less radial restriction and in a

substantially natural direction towards and into the apertures (8) of the receiving body (16).

9. The end termination means according to claim 8, characterized in that the receiving body (16) acts as a gathering element for the strands (5;5', 6) between the embracing element (17) and the terminating sleeve (9).

10. The end termination means according to 1, characterized in that the apertures (8) of the receiving body (16) are somewhat inclined relative to the longitudinal axis of the tension leg (10) and the inclination corresponds to the natural direction of the strands (5;5', 6) between the embracing element (17) and the terminating sleeves (9).

11. The end termination means according to 1, characterized in that the end termination (15) comprises an external rigid sleeve (18) fixed at one end thereof to the receiving body (16) and in its other end to the embracing element (17).

12. The end termination means according to 1, characterized in that the receiving body (16) on its external surface has at least one annular groove (16a) for engagement with at least one first annular rib (21a) on a connecting part (21) that is connected to a connecting point (20).

13. A coupling for use between an end termination and a connecting point according to claim 12, characterised in that the connecting point (20) has at least one external annular groove (20a) for engagement with at least one second annular rib (21b) arranged on the connecting part (21) a distance apart from the at least one first rib (21a), which connecting part (21) is radially fixed by an upper and lower embracing connecting part (22a, 22b).

14. A coupling for use between an end termination and a connecting point according to claim 13, characterised in that an upper and lower radially outer surface (21c, 21d) on the connecting part (21) has an upward directed conical form and an upper and lower radially inner surface (22c, 22d) on the respective embracing connecting parts (22a, 22b) has complementary conical form.

15. A coupling according to claim 13 or 14, characterised in that the connecting parts (20a, 22b) comprise respective pin screws (23a, 23b) for temporary fixation of the connecting parts (22a, 22b) to the connecting point (20) and the receiving body (16) respectively.

* * * * *



(12) 实用新型专利

(10) 授权公告号 CN 201695336 U

(45) 授权公告日 2011. 01. 05

(21) 申请号 201020302576. 0

(22) 申请日 2010. 02. 08

(73) 专利权人 柳州欧维姆机械股份有限公司

地址 545005 广西壮族自治区柳州市龙泉路
3 号

(72) 发明人 李文献 宋强 赵靖钊 覃巍巍
陈昱鹏

(74) 专利代理机构 柳州市荣久专利商标事务所
(普通合伙) 45113

代理人 张荣玖

(51) Int. Cl.

E01D 19/16 (2006. 01)

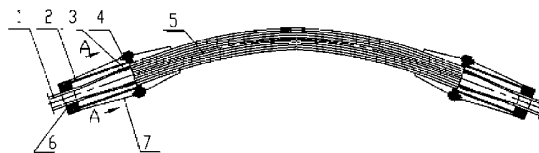
权利要求书 1 页 说明书 3 页 附图 1 页

(54) 实用新型名称

带有抗滑结构的斜拉桥索鞍

(57) 摘要

一种带有抗滑结构的斜拉桥索鞍, 包括由 n 根钢绞线组成的拉索、保护筒、连接件和由 x 根小圆管组成的索鞍, 在单根钢绞线上固结有一空心柱状体, 拉索的各单根钢绞线分别从索鞍的小圆管中穿过, 该空心柱状体的一个端面与索鞍的一个端面接触, 带有空心柱状体的钢绞线的根数为 m , 保护筒通过连接件与索鞍联接, m 、 n 和 x 的取值范围是: m 、 n 和 x 均为 $1 \sim 1000$ 之间的任意整数, 其中 $m \leq n \leq x$ 。在单根钢绞线上固结的空心柱状体或同时位于索鞍的一边, 或分别位于索鞍的两边, 所述空心柱状体是空心的圆柱体或椭圆柱体或方柱体、或规则或不规则的多边形柱体。该索鞍在施工时就可以提供足够的抗滑力, 该抗滑力从施工到成桥及后期的营运整个过程是持续的。



1. 一种带有抗滑结构的斜拉桥索鞍,包括由 n 根钢绞线组成的拉索 (1)、保护筒 (2)、连接件 (4) 和由 x 根小圆管组成的索鞍 (5),其特征在于:在单根钢绞线上固结有一空心柱状体 (3),拉索 (1) 的各单根钢绞线分别从索鞍 (5) 的小圆管中穿过,该空心柱状体 (3) 的一个端面与索鞍的小圆管的端面接触,带有空心柱状体的钢绞线的根数为 m ,保护筒 (2) 通过连接件 (4) 与索鞍 (5) 联接,组成拉索 (1) 的钢绞线根数 n 小于等于组成索鞍 (5) 之小圆管的根数 x ,带有空心柱状体的钢绞线的根数 m 小于等于组成拉索 (1) 的钢绞线根数 n , m 、 n 和 x 的取值范围是: m 、 n 和 x 均为 $1 \sim 1000$ 之间的任意整数,其中 $m \leq n \leq x$ 。

2. 根据权利要求 1 所述的带有抗滑结构的斜拉桥索鞍,其特征在于:在单根钢绞线上固结的空心柱状体 (3) 同时位于索鞍 (5) 的一边。

3. 根据权利要求 1 所述的带有抗滑结构的斜拉桥索鞍,其特征在于:在单根钢绞线上固结的空心柱状体 (3) 分别位于索鞍 (5) 的两边、各边带有空心柱状体 (3) 的钢绞线的根数 $m \leq n$ 。

4. 根据权利要求 1、2 或 3 所述的带有抗滑结构的斜拉桥索鞍,其特征在于:所述保护筒通过连接件与索鞍联接的连接件是连接螺栓、销轴或铆钉,其固定联接方式为螺栓连接、销轴连接或铆接联接;所述小圆管是用钢、塑料、橡胶或合成材料制成的小圆管。

5. 根据权利要求 1、2 或 3 所述的带有抗滑结构的斜拉桥索鞍,其特征在于:所述保护筒是普通锚固筒、抗滑移锚固筒或具有保护功能的罩体。

6. 根据权利要求 4 所述的带有抗滑结构的斜拉桥索鞍,其特征在于:所述保护筒是普通锚固筒、抗滑移锚固筒或具有保护功能的罩体。

7. 根据权利要求 1、2 或 3 所述的带有抗滑结构的斜拉桥索鞍,其特征在于:在所述单根钢绞线上固结的空心柱状体 (3) 是带内孔的圆柱体、椭圆柱体、方柱体、六边形柱体、八边形柱体或横截面为规则或不规则的多边形之多边形柱体,其内孔横截面的形状与单根钢绞线的横截面外形相同、其大小为紧固结合。

8. 根据权利要求 6 所述的带有抗滑结构的斜拉桥索鞍,其特征在于:在所述单根钢绞线上固结的空心柱状体 (3) 是带内孔的圆柱体、椭圆柱体、方柱体、六边形柱体、八边形柱体或横截面为规则或不规则的多边形之多边形柱体,其内孔横截面的形状与单根钢绞线的横截面外形相同、其大小为紧固结合。

带有抗滑结构的斜拉桥索鞍

【技术领域】

[0001] 本实用新型涉及一种桥梁结构件,特别是一种矮塔斜拉桥索鞍。

【背景技术】

[0002] 矮塔斜拉桥拉索采用塔上索鞍支撑,由于结构在建造和营运中不可避免带来塔两侧拉索受力不平衡,因此对索鞍段拉索进行必要的限制,即须有抗滑移装置。本申请人的授权公告号为 CN2756692Y、名称为“带有抗滑锚的斜拉桥索鞍”实用新型专利,公开了一种包括:拉索 21、环氧砂浆 22、抗滑锚固筒 23、高强螺栓组 24、密封垫 25 和索鞍 26 等组成的带有抗滑锚的斜拉桥索鞍(参见图 2-1、图 2-2),从实施效果来看完全能满足抗滑移要求,且工艺可行。但该技术还存在以下的不足:

[0003] 1. 该带有抗滑锚的斜拉桥索鞍的抗滑锚固筒 23 需在所有拉索施工张拉结束后灌注环氧砂浆 22 等握裹剂来产生对拉索的握裹力,从而实现对拉索的抗滑移作用,因此在桥的建造期间是无法提供足够的抗滑力的;

[0004] 2. 在抗滑锚固筒内的钢绞线必须剥去小 PE,并且将油脂清洗干净,才能使握裹剂与钢绞线充分握裹,形成抗滑力。

【实用新型内容】

[0005] 本实用新型的目的在于提供一种改进后的带有抗滑结构的斜拉桥索鞍,该带有抗滑结构的斜拉桥索鞍的防滑结构在施工时就可以提供足够的抗滑力,其抗滑力是持续的,即从施工到成桥及后期的营运整个过程都有足够的抗滑力。以解决已有技术存在的上述问题。

[0006] 解决上述问题的技术方案是:一种带有抗滑结构的斜拉桥索鞍,包括由 n 根钢绞线组成的拉索、保护筒、连接件和由 x 根小圆管组成的索鞍,在单根钢绞线上固结有一空心柱状体,拉索的各单根钢绞线分别从索鞍的小圆管中穿过,该空心柱状体的一个端面与索鞍的一个端面接触,带有空心柱状体的钢绞线的根数为 m ,保护筒通过连接件与索鞍联接,组成拉索 (1) 的钢绞线根数 n 小于等于组成索鞍 (5) 之小圆管的根数 x ,带有空心柱状体的钢绞线的根数 m 小于等于组成拉索 (1) 的钢绞线根数 n , m 、 n 和 x 的取值范围是: m 、 n 和 x 均为 $1 \sim 1000$ 之间的任意整数,其中 $m \leq n \leq x$ 。

[0007] 所述保护筒是普通锚固筒、抗滑移锚固筒或具有保护功能的罩体。

[0008] 所述保护筒通过连接件与索鞍联接的连接件是连接螺栓、销轴或铆钉,其固定连接方式包括螺栓连接、销轴连接或铆接联接。

[0009] 所述小圆管是用钢、塑料、橡胶或合成材料制成的小圆管。

[0010] 在单根钢绞线上固结的空心柱状体或同时位于索鞍的一边,或分别位于索鞍的两边,各边带有空心柱状体的钢绞线的根数 $m \leq n$ 。

[0011] 在单根钢绞线上固结的空心柱状体是带内孔的圆柱体、椭圆柱体、方柱体、多边形柱或不规则柱体,其内孔横截面的形状与单根钢绞线的横截面外形相同、其大小为紧固结

合。

【0012】 由于采取上述结构,本实用新型之带有抗滑结构的矮塔斜拉桥索鞍具有以下有益效果:

【0013】 1. 带有抗滑结构的斜拉桥索鞍的抗滑结构在施工时就可以提供足够的抗滑力,其抗滑力是持续的,从施工到成桥及后期的营运整个过程都有足够的抗滑力;

【0014】 2. 本实用新型之带有抗滑结构的矮塔斜拉桥索鞍的拉索可以实现单根换索。

【0015】 下面结合附图和实施例对本实用新型之带有抗滑结构的矮塔斜拉桥索鞍的技术特征作进一步说明。

【附图说明】

【0016】 图 1-1 是带有抗滑结构的矮塔斜拉桥索鞍的结构示意图;

【0017】 图 1-2 是图 1-1 的 A-A 剖视图;

【0018】 图 2-1 是已有带有抗滑锚的斜拉桥索鞍的结构示意图;

【0019】 图 2-2 是图 2-1 的 B-B 剖视图。

【具体实施方式】

【0020】 一种带有抗滑结构的斜拉桥索鞍,包括由 37 根钢绞线组成的拉索 1、保护筒 2、连接件 4 和由 37 根小圆管组成的索鞍 5,在每根钢绞线上固结有一空心圆柱体 3,拉索 1 的各单根钢绞线分别从索鞍 5 的 37 根小圆管中穿过,该空心圆柱体 3 的一个端面与索鞍的一个端面紧密接触,保护筒 2 通过连接件 4 与索鞍 5 固定联接,在单根钢绞线上固结的空心圆柱体 3 分别位于索鞍 5 的两边,各边带有空心圆柱体 3 的钢绞线的根数分别为小于等于 18 根和小于等于 19 根(参见图 1-1 和图 1-2)。

【0021】 本实施例中,所述保护筒 2 可以是普通锚固筒、抗滑移锚固筒或具有保护功能的罩体;

【0022】 所述保护筒 2 通过连接件 4 与索鞍 5 联接的连接件 4 可以是连接螺栓、销轴或铆钉,其固定联接方式包括螺栓连接、销轴连接或铆接联接;

【0023】 所述小圆管是用钢、塑料、橡胶或合成材料制成的小圆管。

【0024】 图 1-1 和图 1-2 中所示的保护筒 2 是抗滑移锚固筒,连接件 4 是连接螺栓,抗滑移锚固筒 2 通过连接螺栓 4 与索鞍 5 固定联接,图中,6 是减震体,7 是筋板。

【0025】 作为本实用新型实施例的一种变换,在每根钢绞线上固结的空心圆柱体 3 也可以同时位于索鞍 5 的一边。

【0026】 作为本实用新型实施例的又一种变换,所述组成拉索 1 的钢绞线根数 n 与组成的索鞍 5 之小圆管的根数 x 可以增加或减少;但组成拉索 1 的钢绞线根数 n 小于等于组成索鞍 5 之小圆管的根数 x ,带有空心柱状体的钢绞线的根数 m 小于等于组成拉索 1 的钢绞线根数 n ,一般 m 、 n 和的 x 取值范围是: m 、 n 和 x 均为 $1 \sim 1000$ 之间的任意整数,其中 $m \leq n \leq x$ 。

【0027】 作为本实用新型实施例的又一种变换,在所述每根钢绞线上固结的空心圆柱体 3 也可以是其他形状的柱状体,如带内孔的椭圆柱体、方柱体、六边形柱体、八边形柱体、或横截面为规则或不规则的多边形之多边形柱体,其内孔横截面的形状与单根钢绞线的横截面外形相同、其大小为紧固结合;在每根钢绞线上固结的空心柱状体或同时位于索鞍的一边,

或分别位于索鞍的两边、且各边带有空心柱状体的钢绞线的根数可以相同、也可以不同。

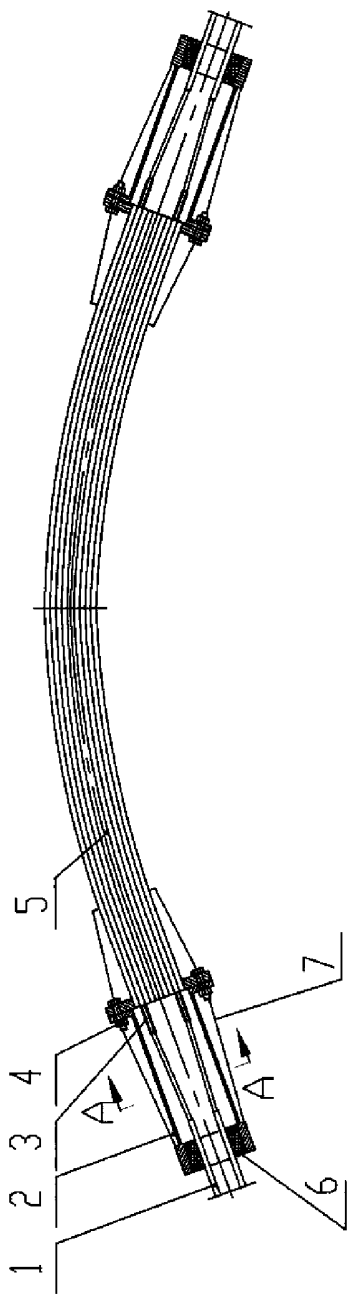


图 1-1

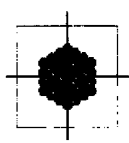


图 1-2

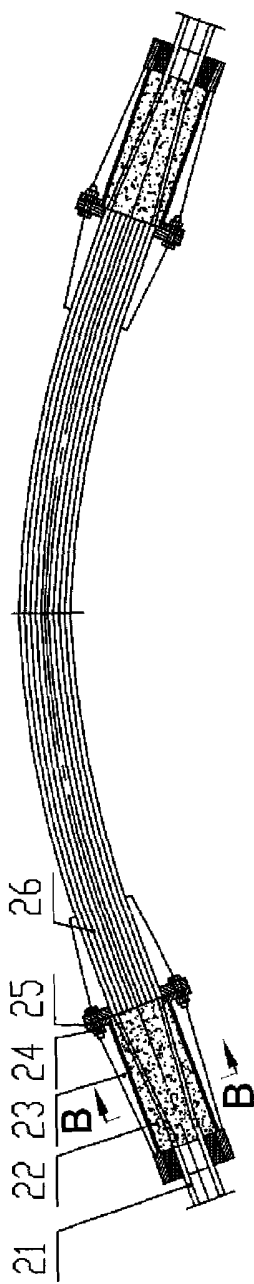


图 2-1

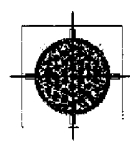


图 2-2



US006487757B1

(12) **United States Patent**
Stubler et al.

(10) **Patent No.:** **US 6,487,757 B1**
(45) **Date of Patent:** **Dec. 3, 2002**

(54) **SYSTEM FOR CONNECTING A
STRUCTURAL CABLE TO A BUILDING
WORK STRUCTURE**

(75) Inventors: **Jérôme Stubler**, Paris (FR);
René-Louis Geffroy, Meudon-La-Forêt
(FR)

(73) Assignee: **Freyssinet International (STUP)** (FR)

(*) 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.: **09/831,841**

(22) PCT Filed: **Sep. 12, 2000**

(86) PCT No.: **PCT/FR00/02513**

§ 371 (c)(1),
(2), (4) Date: **May 15, 2001**

(87) PCT Pub. No.: **WO01/20081**

PCT Pub. Date: **Mar. 22, 2001**

(30) **Foreign Application Priority Data**

Sep. 15, 1999 (FR) 99 11516

(51) Int. Cl.⁷ **E04C 5/12; F16B 11/04;**
F16B 1/20

(52) U.S. Cl. **24/122.6; 24/115 M; 24/136 R**

(58) Field of Search **24/136 R, 115 M,**
24/122.6

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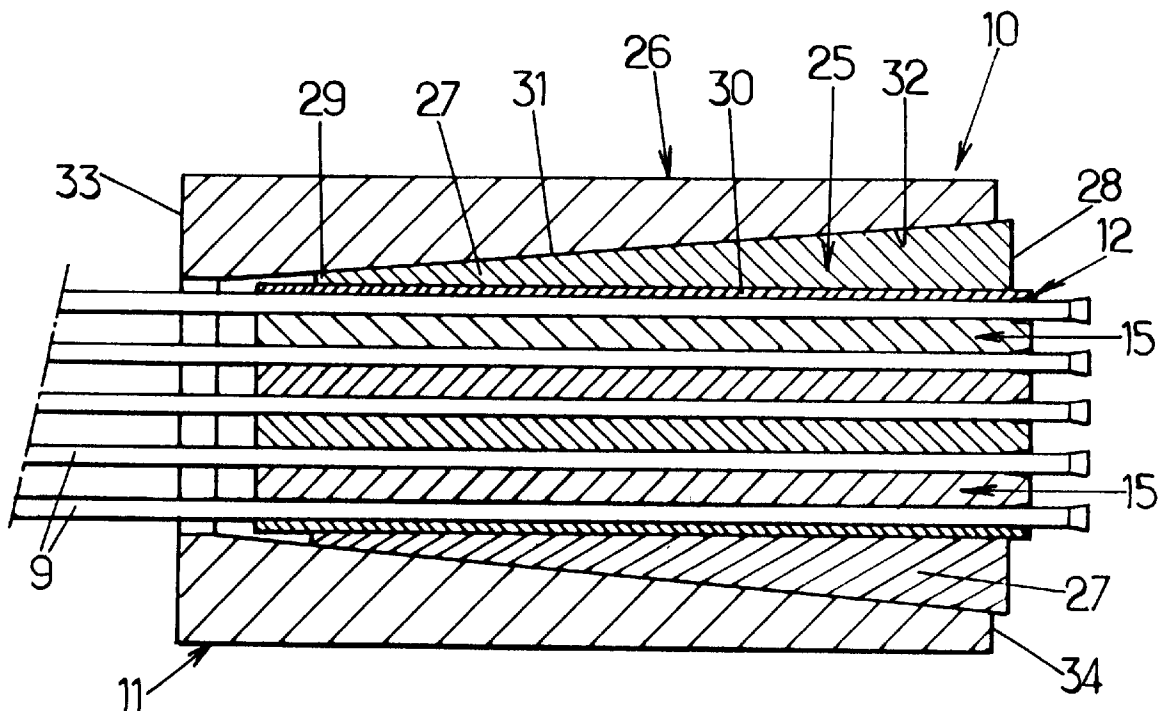
Primary Examiner—Victor Sakran

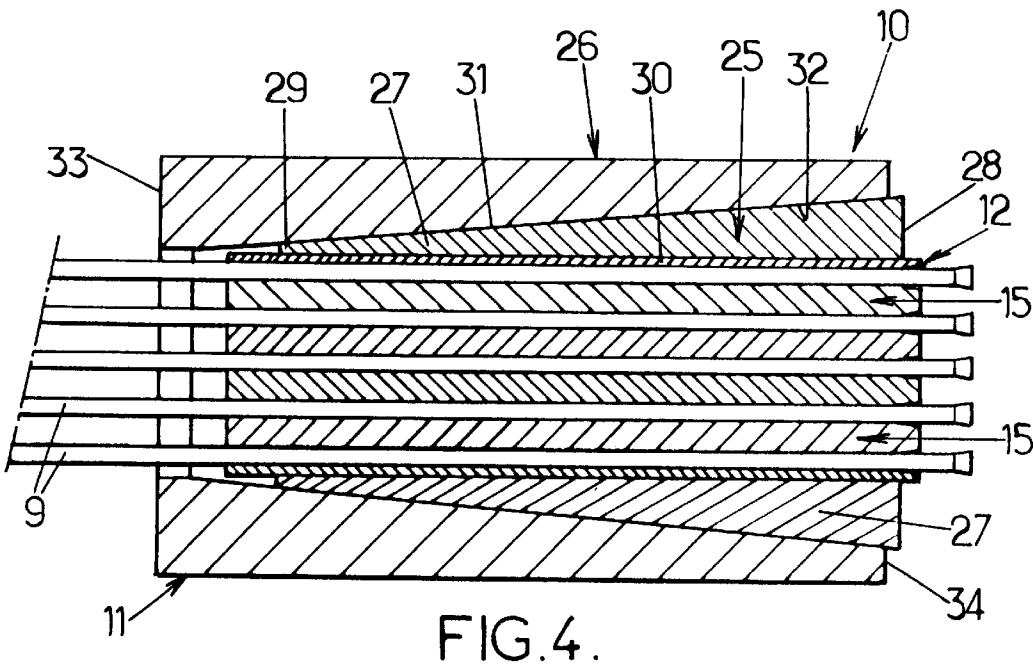
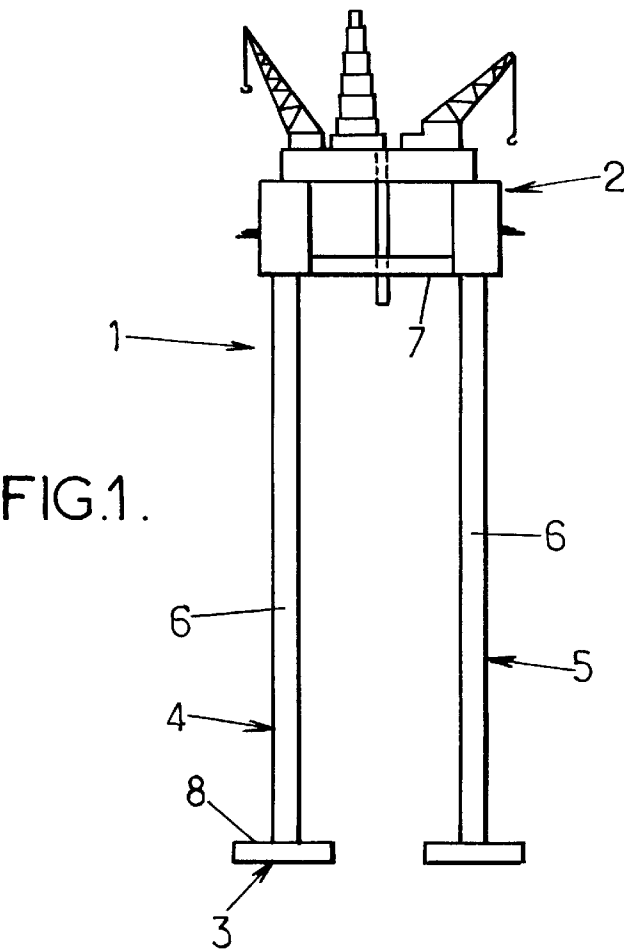
(74) *Attorney, Agent, or Firm*—Cantor Colburn LLP

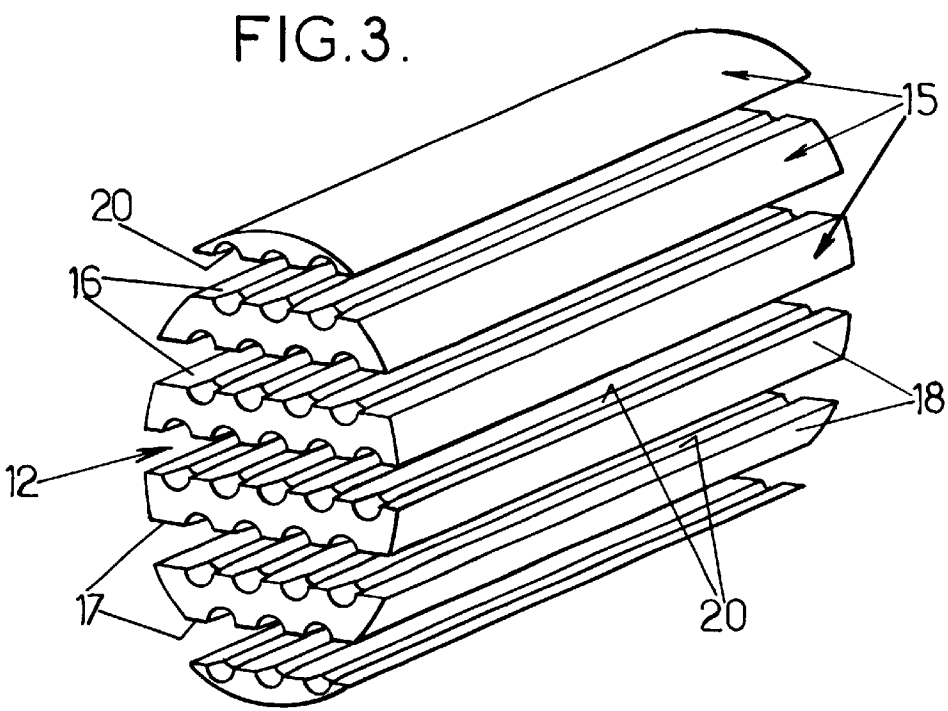
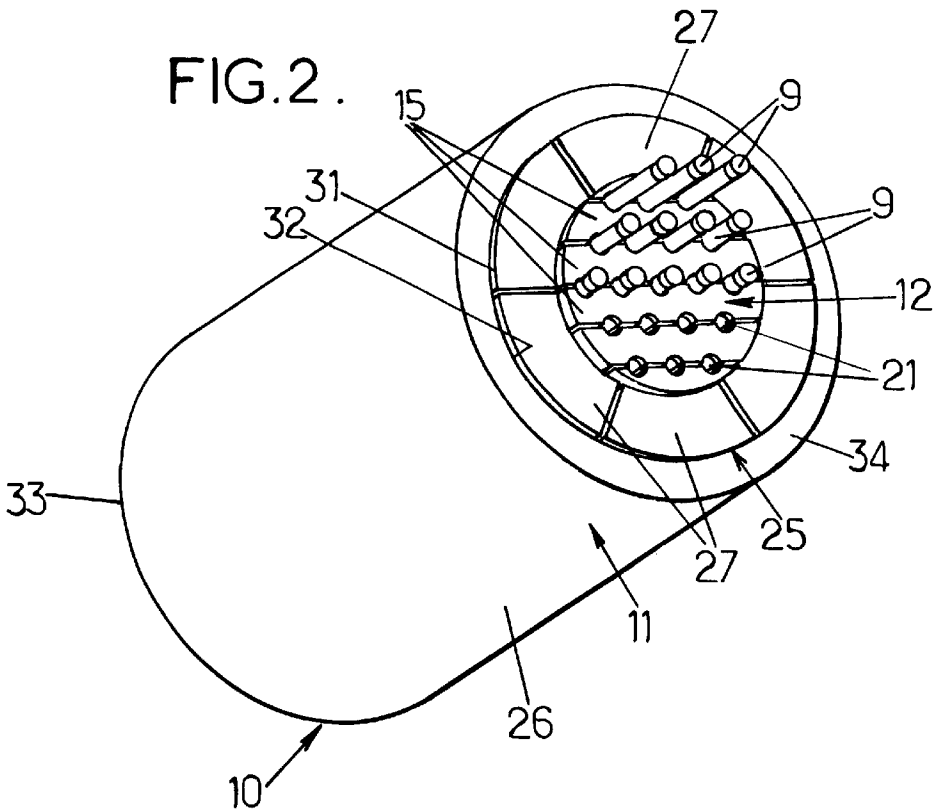
(57) **ABSTRACT**

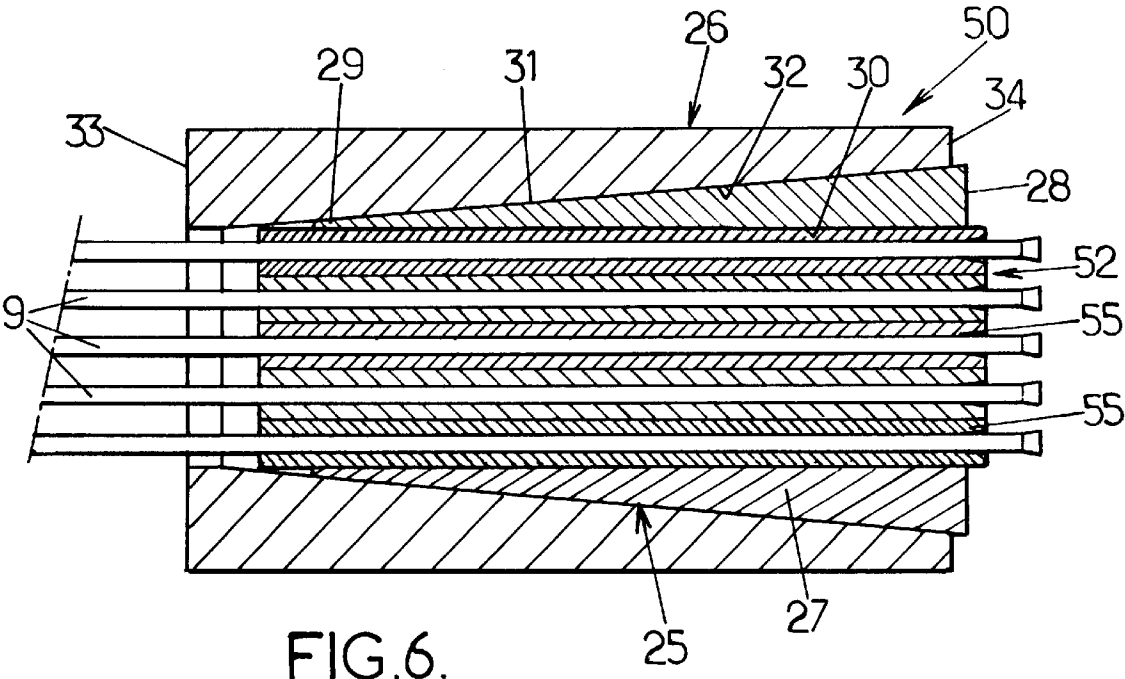
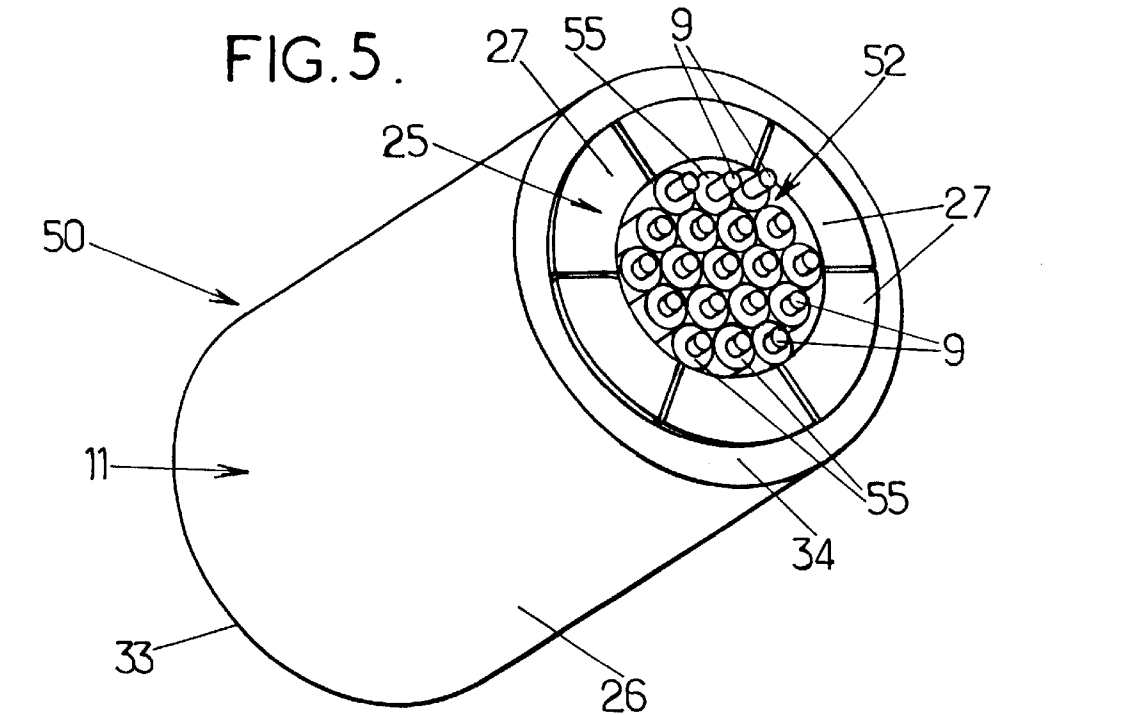
A connecting system for connecting a cable including at least one wire for a building work structure and an element of the structure. The connecting system comprises a clamping device which is connected to the element of the structure, and a load transmitting device which transmits a clamping load of the clamping device to the cable and which houses the at least one wire of the cable. The at least one wire is bonded into the load transmitting device.

12 Claims, 3 Drawing Sheets









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SYSTEM FOR CONNECTING A STRUCTURAL CABLE TO A BUILDING WORK STRUCTURE

FIELD OF INVENTION

The present invention relates to a connecting system for connecting a cable for a building work structure and an element of this structure, the cable comprising at least one wire.

The present invention relates in particular to cables made up of a certain number of strands themselves combining several wires, which are stressed particularly in tension in building work structures Such as offshore platforms of the tension-leg type, or suspension or cable stayed bridges.

DESCRIPTION OF RELATED ART

Connecting systems are needed to anchor the cables, for example, in the sea bed. These systems are not always easy to access, which makes them expensive to install.

SUMMARY OF THE INVENTION

It is an object of the invention to provide a connecting system in which the wires are firmly anchored to withstand in particular tensile loadings and to do so using means which are simple, effective and inexpensive.

To this end, according to the invention, a connecting system of the kind in question is essentially characterized in that it comprises:

- a clamping device which is connected to the structure element, and
- a load transmitting device which transmits the clamping loads of the clamping device to the cable and which houses said at least one wire of the cable, and in that said at least one wire is bonded into the load transmitting device.

Thus, by virtue of these provisions, each wire of the cable is firmly and simply held when this wire is tensioned.

In preferred embodiments of the reinforcement according to the invention, recourse is further had to one and/or another of the following provisions:

- the clamping device comprises at least two keys of a jaw assembly, which bear against the load transmitting device and means for compressing the jaw assembly;
- the compressing means comprise a sleeve, the interior wall of which converges toward one end of the sleeve, the keys of the jaw assembly being of a shape that complements that of said interior wall and being mounted in the sleeve so that they can be clamped in the sleeve by a wedge effect;
- the keys have an approximately triangular longitudinal cross section;
- the transmitting device comprises at least two plates, each of the plates carrying at least one channel of a shape that complements at least part of the shape of the cross section of the wire, the plates being mounted facing each other so that the channels in the plates form at least one passageway in which said at least one wire is housed;
- a number of wires is housed in a number of passageways themselves delimited by a number of plates (11) which are stacked one upon the other to form at least one strand;
- the keys entirely cover the exterior surface of a portion of the strand;

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the transmitting device comprises at least one cylindrical sleeving in which said at least one wire is housed; said at least one wire is forced into said at least one sleeving;

a number of sleeveings are mounted adjacent to one another in the keys;

the wires are made of a carbon-fiber-based composite; and the wires are solid wires.

BRIEF DESCRIPTION OF THE DRAWINGS

Other features and advantages of the invention will emerge during the detailed description which follows of two of its embodiments which are given by way of nonlimiting examples with reference to the appended drawings in which:

FIG. 1 is an overall schematic view of an offshore platform comprising cables anchored by connecting systems according to the present invention;

FIG. 2 is a perspective view of a first embodiment of one of the connecting systems of FIG. 1 according to the present invention;

FIG. 3 is an exploded perspective view of just the plates of the system of FIG. 2;

FIG. 4 is a view in longitudinal section of the system of FIG. 2;

FIG. 5 is a perspective view of a second embodiment of one of the connecting systems of FIG. 1 according to the present invention; and

FIG. 6 is a view in longitudinal section of the system of FIG. 5.

DESCRIPTION OF PREFERRED EMBODIMENT

The building work structure 1 depicted in FIG. 1 and into which a number of connecting systems according to the present invention are incorporated adopts, for example, the form of an offshore platform. This platform in the conventional way comprises an upper part 2 which is generally located above sea level and which is anchored into the sea bed 3 by series 4, 5 of cables 6.

Each cable is tensioned between a constituent element 7 of the platform 1, for example beams of the upper part 2, and an anchoring block located on the sea bed 3, by means of connecting systems 10 which will be described hereinafter. Each cable is subjected to significant tensile loadings while at the same time having very good fatigue strength and exhibiting very good corrosion resistance.

Each cable 6 consists, in a way known per se, of a bundle of several strands which are themselves made up of a series of elementary wires 9. The reader will appreciate in what follows that each cable may be reduced to one strand or even one elementary wire.

As is more particularly visible in FIGS. 2 and 4, each strand consists of a collection of wires 9 which are, for example, mutually parallel at their ends. The strands thus formed may be combined with other strands to form the cable 6.

Each wire 9 is made of a metallic material or of a composite made up of unidirectional fibers embedded in a resin matrix. The unidirectional fibers are preferably made of carbon and may be high-strength fibers or high-modulus fibers which are embedded in a crosslinked epoxy matrix obtained, for example, by a pultrusion method.

Advantageously, the wires 9 are of cylindrical shape on a circular base and are solid wires. They may equally be of any other profile, such as a square or hexagonal profile.

The connecting system **10** according to the present invention comprises a clamping device **11** which is connected to the structure element **7** and a load transmitting device **12**. This transmitting device is subjected to the clamping forces exerted uniformly by the clamping device **11** and transmits these forces to the wires **9** of the strand which are thus firmly clamped.

The transmitting device **12** consists, in the first embodiment, of a certain number of plates **15** between which the wires **9** are housed.

Each of the plates **15** is of roughly rectangular shape and has a top side **16**, an underside **17** which is roughly flat, and longitudinal edges **18** which, taken along the thickness of the plate, are of curved shape so that the collection of plates **15**, once superposed one on the other, form a cylinder on a circular base. Thus, each plate **15** forms a kind of longitudinal slide of a cylinder, which is thin in comparison with its length.

Each top side **16** and each underside **17** of the plates **15** has a channel **20**. The cross section of the channels **20** is similar to half the cross section of the wires **9**.

The channels **20** of a top side **16** of one plate **15** face the channels **20** of an underside **17** of the next plate **15**. The channels **20** thus, in pairs, define passageways **21**, the cross section of which complements that of the wires **9**.

The plates **15** are made of a metallic material or of a composite or organic material.

The clamping device **11** consists of a jaw assembly **25** and of means **26** which in this instance adopt the form of a sleeve for compressing the jaw assembly **25**.

The jaw assembly **25** has a number of keys **27**. The collection of keys **27** defines a cylinder on an annular base having a proximal end **28** and a distal end **29**. The inside diameter of this cylinder is similar to the diameter of the cylindrical stack of plates **15**. The wall thickness at the proximal end **28** is greater than the wall thickness at the distal end **29**. The proximal end is the end from which the ends of the wires **9** project, while the distal end is the end from which the wires run toward the rest of the building work.

Thus, each key **27** has an interior face **30** bearing against the plates **15** and an exterior face **31** that converges toward the interior face **30**.

The sleeve **26** is a cylinder on an annular base, the interior wall **32** of which has a shape that complements that of the exterior wall of the cylinder defined by the keys **27**. Thus, the sleeve **26** has a first end or distal end **33**, the opening of which has a diameter smaller than the opening of the second end or proximal end **34** of this sleeve.

In consequence, the interior wall **32** of the sleeve is of frustoconical shape and complements the exterior shape, itself frustoconical, of the cylinder defined by the collection of keys **27**. The diameter of the opening at the end **33** is slightly greater than the diameter of the cylinder defined by the stack of plates **15**.

In order to produce the previously described connecting system **10**, adhesive is applied to each of the channels **20** of the plates **15**, then the wires **9** are set in place in these channels and the plates **15** are stacked one on the other. The stack thus produced is then inserted into the keys **27**. The assembly is then slipped into the sleeve **26** via the proximal end **34**, the opening of which has a large diameter. The keys **27** are compressed by a wedge effect between their exterior surface and the interior face of the sleeve **26** so that a predetermined clamping force is applied to the plates **15** and

is transmitted to the wires **9**. All that is then required is for the adhesive to dry.

The predetermined clamping force on the wires **9** is dependent on the slope of each of the inclined faces of the keys and of the sleeve and on the force with which the keys **27** are inserted into the sleeve **26**.

Thus, each wire **9** of a strand is firmly anchored to withstand, for example, tensile forces.

In the embodiment previously described, the plates **15** of the load transmitting device occupy the entire interior volume of the cylinder defined by the keys **27**.

In the second embodiment depicted in FIGS. **5** and **6**, the connection system **50** differs from the previously described one only in the form of the load transmitting device **52**, the other constituent elements are similar and bear identical numeral references.

The transmitting device **52** no longer occupies the entire interior volume of the cylinder defined by the keys **27** of the jaw assembly **25**. This device consists of a number of metal sleeveings **55**, for example made of aluminum. The sleeveings **55** are of an inside diameter roughly identical to the diameter of the wires **9** so that these wires are forced into the sleeveings. The outside diameter of the sleeveings is small by comparison with the inside diameter of the cylinder delimited by the keys **27**.

The wires **9** are also bonded into the sleeveings **55**. These sleeveings are made of a material with a low elastic limit, possessing a certain plasticity.

The way in which the connecting system **50** is mounted is roughly identical to the way in which the system of the first embodiment is mounted. The sleeveings **55** are tangential to one another inside the keys, each of the sleeveings **55** being in contact with the adjacent sleeveings or with a key on three generatrices. In fact, at the time of clamping, the sleeveings are crushed slightly so that each sleeveing is in contact on three surfaces. Only some of them, the peripheral sleeveings, are in contact with the keys.

As an alternative, the sleeveings may be bonded together, filling the gaps between the sleeveings.

In yet another alternative, the sleeveings **55** have, in cross section, an exterior shape which is not circular but similar to a, diamond or some other shape, so that the sleeveings can easily be juxtaposed.

What is claimed is:

1. Connecting system for connecting a cable for a building work structure and an element of the structure, the cable comprising at least one wire, the connecting system comprising:

a clamping device which is connected to the element; and
a load-transmitting device which transmits a clamping load of the clamping device to the cable and which houses said at least one wire of the cable, said at least one wire being bonded into the load transmitting device.

2. Connecting system according to claim **1**, wherein the clamping device comprises at least two keys of a jaw assembly, which bear against the load transmitting device and a compressing means for compressing the jaw assembly.

3. Connecting system according to claim **2**, wherein the compressing means comprises a sleeve having an interior wall which converges toward one end of the sleeve, the keys of the jaw assembly being of a shape that complements that of said interior wall and being mounted in the sleeve so that the keys can be clamped in the sleeve by a wedge effect.

4. Connecting system according to claim **3**, wherein the keys have an approximately triangular longitudinal cross section.

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5. Connecting system according to claim 4, wherein the transmitting device comprises at least two plates, each of the plates carrying at least one channel of a shape that complements at least a portion of a shape of a cross section of the wire, the plates being mounted facing each other so that the channels in the plates form at least one passageway in which said at least one wire is housed.

6. Connecting system according to claim 5, wherein a number of wires are housed in a number of passageways themselves delimited by a number of plates which are stacked one upon the other to form at least one strand.

7. Connecting system according to claim 6, wherein the keys entirely cover an exterior surface of a portion of the strand.

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8. Connecting system according to claim 4, wherein the transmitting device comprises at least one cylindrical sleeving in which said at least one wire is housed.

9. Connecting system according to claim 8, wherein said at least one wire is forced into said at least one sleeving.

10. Connecting system according to claim 9, wherein a number of sleeveings are mounted adjacent to one another in the keys.

11. Connecting system according to claim 4, wherein the wires are made of a carbon-fiber-based composite.

12. Connecting system according to claim 4, wherein the wires are solid wires.

* * * * *



[12] 实用新型专利说明书

[21] ZL 专利号 03280461. X

[45] 授权公告日 2004 年 11 月 24 日

[11] 授权公告号 CN 2658212Y

[22] 申请日 2003.9.10 [21] 申请号 03280461. X
[73] 专利权人 柳州欧维姆机械股份有限公司
地址 545005 广西壮族自治区柳州市龙泉路 3 号
[72] 设计人 李文献 赵靖钊

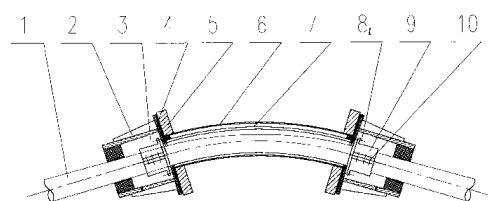
[74] 专利代理机构 柳州市荣久专利事务所
代理人 张荣玖

权利要求书 1 页 说明书 3 页 附图 3 页

[54] 实用新型名称 带抗滑锚的矮塔斜拉桥索鞍

[57] 摘要

一种带抗滑锚的矮塔斜拉桥索鞍，包括索鞍及位于两端的防滑锚头，拉索穿过索鞍被位于索鞍两端的防滑锚头锚固，所述的索鞍由索鞍外管(6)、索鞍内管(7)构成，所述的防滑锚头由抗滑锚筒(2)、密封垫(4)、垫板(5)及灌装在抗滑锚筒(2)内的环氧砂浆(3)构成，其特征在于：抗滑锚筒里有抗滑索夹(9)，该抗滑索夹(9)卡在拉索(1)上，用锁紧螺栓(10)上紧，并通过索夹抗滑顶紧器与密封板(4)紧固联接，所述的索夹抗滑顶紧器可以是螺栓(81)，也可以是锁紧螺母(82)。该带抗滑锚的矮塔斜拉桥索鞍可增大钢绞线与环氧砂浆的接触面、使钢绞线与环氧砂浆更充分握裹，使锚固更安全可靠、在同等条件下抗滑力足够大而内管尺寸较小。



1、一种带抗滑锚的矮塔斜拉桥索鞍，包括索鞍及位于两端的防滑锚头，拉索穿过索鞍被位于索鞍两端的防滑锚头锚固，所述的索鞍由索鞍外管（6）、索鞍内管（7）构成，所述的防滑锚头由抗滑锚筒（2）、密封垫（4）、垫板（5）及灌装在抗滑锚筒（2）内的环氧砂浆（3）构成，其特征在于：抗滑锚筒里有抗滑索夹（9），该抗滑索夹（9）卡在拉索（1）上，用锁紧螺栓（10）上紧，并通过索夹抗滑顶紧器与密封板（4）紧固联接。

2、如权利要求1所述的带抗滑锚的矮塔斜拉桥索鞍，其特征在于：所述的索夹抗滑顶紧器是螺栓（8₁）。

3、如权利要求1所述的带抗滑锚的矮塔斜拉桥索鞍，其特征在于：所述的索夹抗滑顶紧器是锁紧螺母（8₂），抗滑索夹（9）靠近垫板一端有外螺纹，该螺母上在抗滑索夹（9）螺纹上，与垫板（5）紧密接触。

带抗滑锚的矮塔斜拉桥索鞍

技术领域

本实用新型涉及一种斜拉桥拉索用索鞍，特别是带防滑锚具的索鞍。

背景技术

目前市场上矮塔斜拉桥拉索采用塔上索鞍支撑，由于结构原因，在建造和营运中不可避免带来塔两侧拉索受力不平衡，因此对索鞍段的拉索要限制，即必须有抗滑锚。目前，国内外矮塔斜拉桥在塔两侧对拉索出口段采用灌注环氧砂浆进行握裹，如图5所示：现有的带抗滑锚的矮塔斜拉桥索鞍由拉索（20）、抗滑锚筒（21）、环氧砂浆（22）、密封垫（23）、垫板（24）、索鞍外管（25）、索鞍内管（26）等组成，从实施效果来看是基本能满足抗滑要求，且工艺可行。但也存在以下的不足之处：1、在索鞍的内管里，钢绞线与环氧砂浆的接触面较少，为了保证其足够的接触面，其内管的尺寸要做得较大；2、在索鞍的内管里，钢绞线与环氧砂浆的接触面只有上表面，下部钢绞线与环氧砂浆没有充分握裹，形成的抗滑力分布不均。

技术内容

本实用新型要解决的技术问题是：现有的这种带抗滑锚的矮塔斜拉桥索鞍所存在的钢绞线与环氧砂浆的接触面只有上表面、钢绞线与环氧砂浆的接触面较少，钢绞线与环氧砂浆没有充分握裹，形成的抗滑力分布不均以及其内管的尺寸要做得较大的问题，提供一种可增大钢绞线与环氧砂浆的接触面、使钢绞线与环氧砂浆更充分握裹，安全可靠、抗滑力足够大且内管尺寸较小的带抗滑装置的索鞍。

解决其上述技术问题的技术方案是：一种带抗滑锚的矮塔斜拉桥索鞍，包括索鞍及位于两端的防滑锚头，拉索穿过索鞍被位于索鞍两端的防滑锚头锚固，所述的索鞍由索鞍外管、索鞍内管构成，所述的防滑锚头由抗滑锚筒、密封垫、垫板及灌装在抗滑锚筒内的环氧砂浆构成，其特征在于：抗滑锚筒里有抗滑索夹，该抗滑索夹卡在拉索上，用锁紧螺栓上紧，并通过索夹抗滑顶紧器与密封板紧固联接。

所述的索夹抗滑顶紧器可以是螺栓，也可以是锁紧螺母。

由于采用上述结构，本实用新型之带抗滑锚的矮塔斜拉桥索鞍与现有带抗滑锚的矮塔斜拉桥索鞍相比具有以下积极效果：

1、由于索鞍内设置有抗滑索夹，抗滑索夹可提供一部分抗滑力，使得索鞍的抗滑更可靠；

2、由于使用了抗滑索夹，把在索鞍出口处的拉索的形状约束成正六边形，使得拉索在索鞍里与内管的接触面大大减小，拉索与环氧砂浆可以相对充分的接触，形成相对均匀的抗滑力；

3、在锚固同种数量、质量拉索的前提下，可减小索鞍尺寸、降低成本。

本实用新型索鞍中，由于拉索与环氧砂浆有足够大的接触面，保证有足够大的抗滑力，在同种数量、质量拉索的前提下，索鞍内管的径向尺寸可缩小，随着内管的缩小，外管也一样缩小，由于整个索鞍径向尺寸的减小，使得索塔在索鞍处强度的削弱较小；同时由于索鞍尺寸的减小，索夹把拉索约束成正六边形，使得配套索的外包 PE 管的尺寸大大缩小，PE 管的成本可大大降低，索鞍尺寸的减小还可大大降低索鞍的造价，使得整个拉索的配套件的成本大大降低，使此种类型的产品更具有竞争力。

附图说明：

图 1：本实用新型实施例一之带抗滑锚的矮塔斜拉桥索鞍的结构示意图；

图 2：图 1、图 4 的 C—C 剖视图；

图 3：图 1、图 4 的 D—D 剖视图；

图 4：实施例二所述带抗滑锚的矮塔斜拉桥索鞍的结构示意图；

图 5：现有带抗滑锚的矮塔斜拉桥索鞍的结构示意图；

图 6：图 5 的 C'—C' 剖视图；

图 7：图 5 的 D'—D' 剖视图。

具体实施方式：

下面，结合附图和实施例对本实用新型带抗滑锚的矮塔斜拉桥索鞍的技术特征作进一步的说明。

实施例一：

一种带抗滑锚的矮塔斜拉桥索鞍，包括索鞍及位于两端的防滑锚头，拉索穿过索鞍被位于索鞍两端的防滑锚头锚固，所述的索鞍由索鞍外管（6）、索鞍

内管(7)构成,所述的防滑锚头由抗滑锚筒(2)、密封垫(4)、垫板(5)及灌装在抗滑锚筒(2)内的环氧砂浆(3)构成,抗滑锚筒里有抗滑索夹(9),该抗滑索夹(9)卡在拉索(1)上,用锁紧螺栓(10)上紧,并通过索夹抗滑顶紧器与密封板4紧固联接,所述的索夹抗滑顶紧器是螺栓(8₁)。

实施例二:

一种有锁紧螺母的带抗滑锚的矮塔斜拉桥索鞍,其基本结构同实施例一,所不同之处在于,本实施例所用的索夹抗滑顶紧器不是螺栓而是锁紧螺母(8₂),抗滑索夹(9)靠近垫板一端有外螺纹,该锁紧螺母(8₂)上在抗滑索夹(9)螺纹上,与垫板紧密接触。

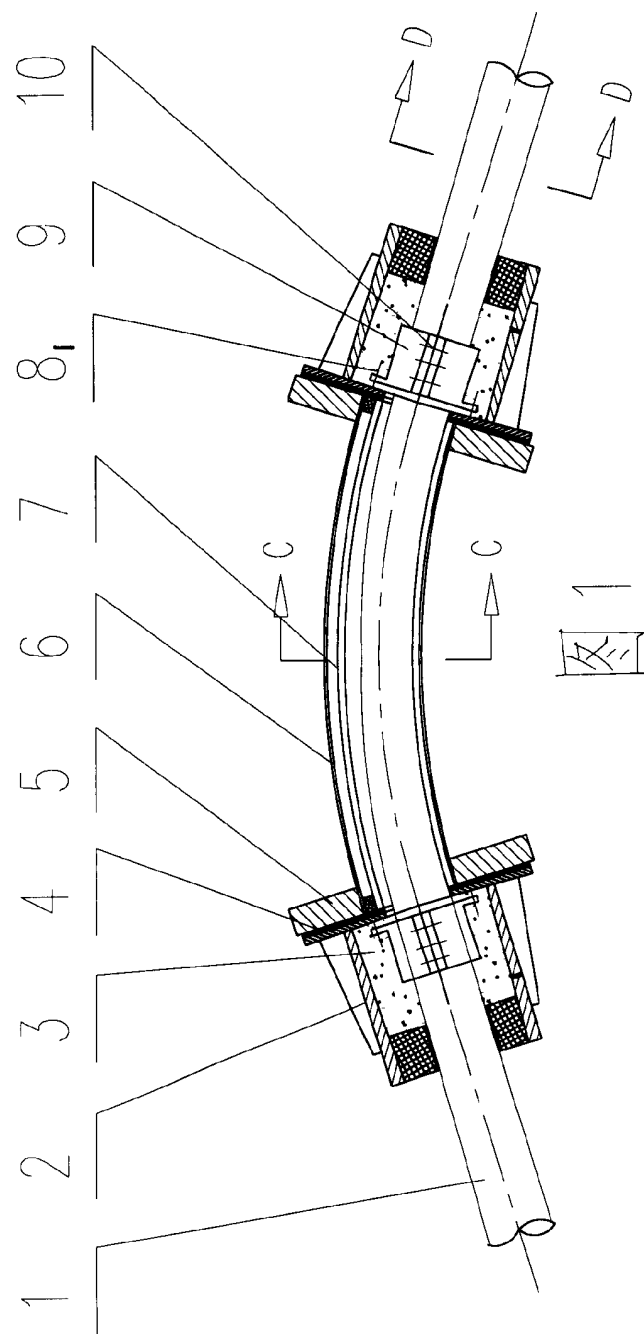


图1

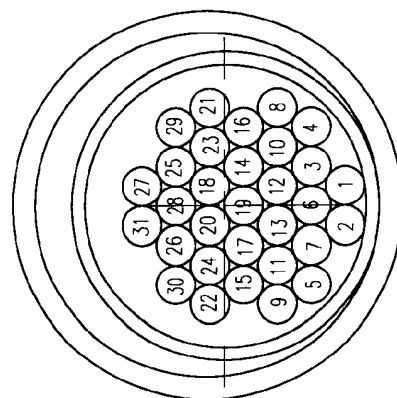


图2

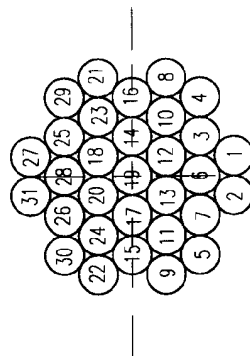


图3

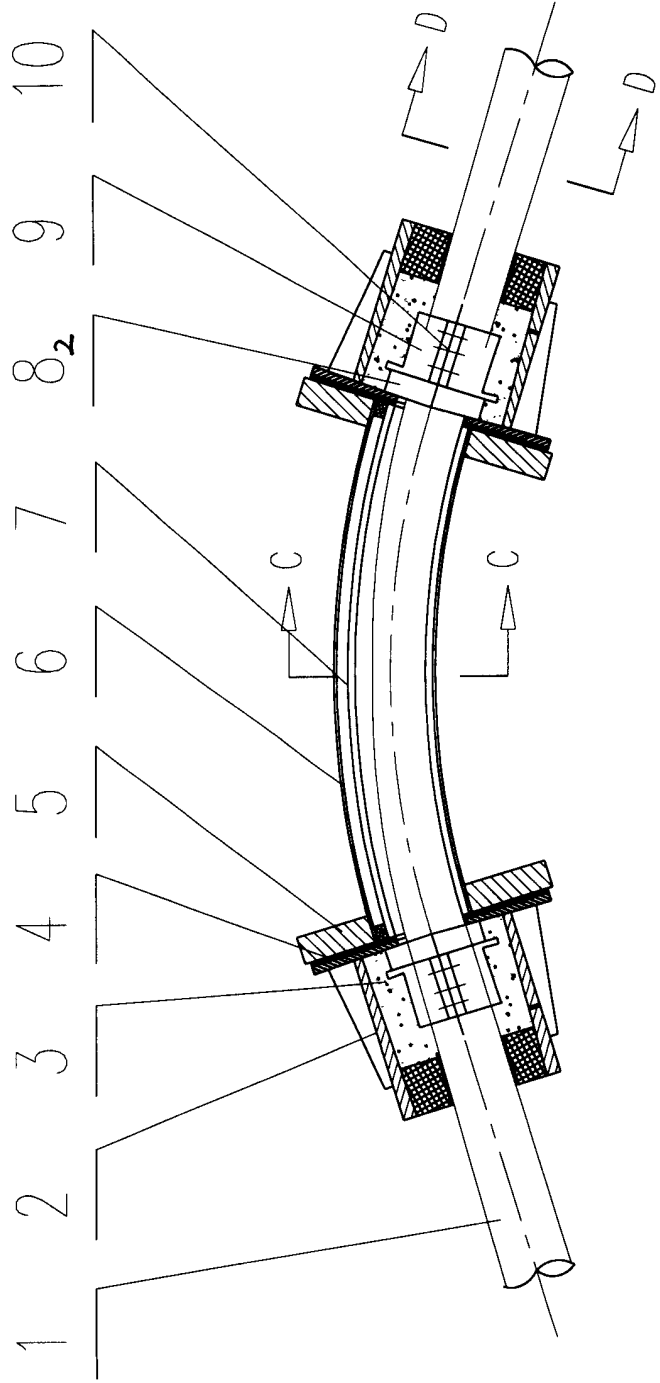


图4

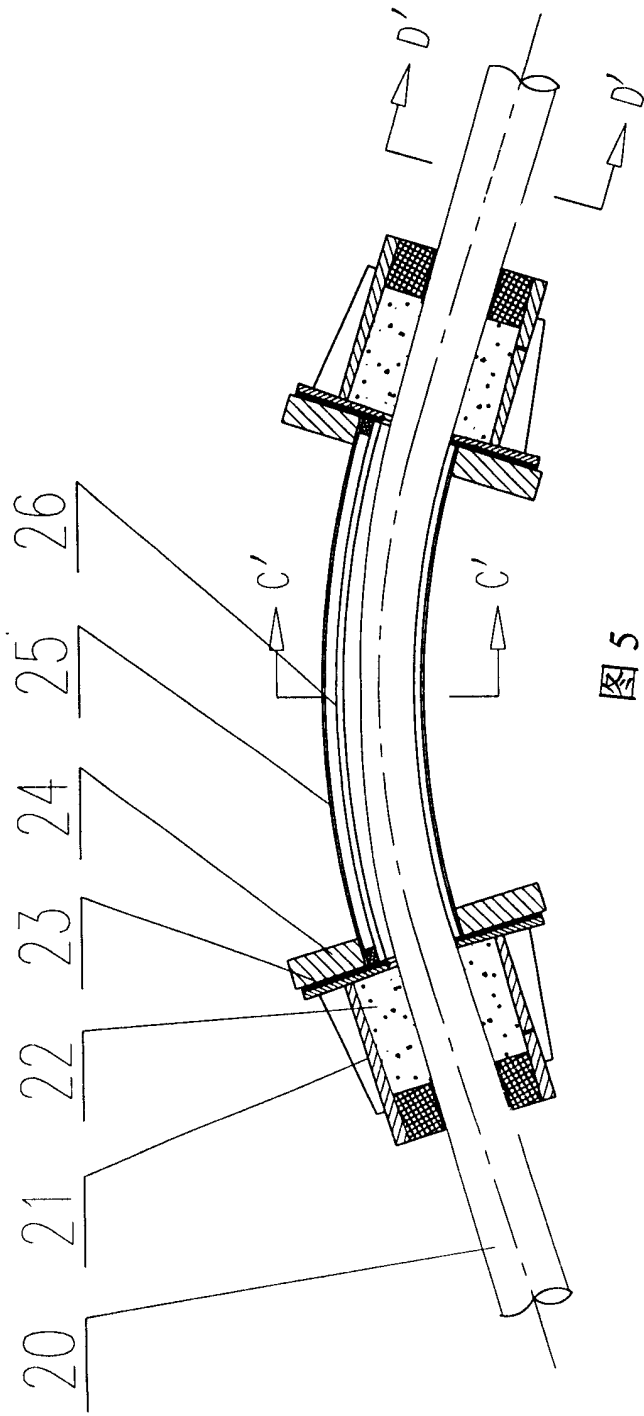


图5

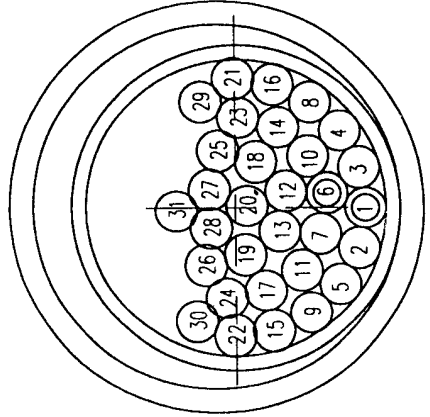


图6

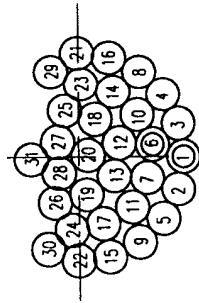


图7