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Method and array for laying up stranded ropes.

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References cited:
EP-A- 0 134 140
EP-A- 0 190 871
DE-B- 1 023 805
GB-A- 1 601 122
GB-A- 2 192 966
US-A- 3 545 194

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Description

The invention relates to a method of laying up stranded ropes, in which a plurality of strands are disposed in substantially parallel interrelationship between front and rear attachment points, the strands being threaded through a strand guide member having guiding apertures therein corresponding to the attachment points, the ends of the strands behind the strand guide member being rotated relatively to the strand guide member about a central axis in the longitudinal direction of the strands, the ends of the strands ahead of the strand guide member being rotated relatively to the strand guide member about their longitudinal axes in the same direction of rotation as the direction of rotation of the ends behind the strand guide member and the strand guide member during the laying up of the rope being moved from the rear strand ends to the front strand ends.

A method of this type is described in EP-A-0134140.

Such methods are conventionally practised in a rope-walk, the strand guide member being designated as bobbin. During the laying up of the rope the bobbin is moved in a fixed orientation relative to the ground from the rear ends of the strands to the front ends of the strands. The ends of the strands at the rear end of the rope-walk are rotated about the axis of a wheel to which they are attached. The opposite ends of the strands at the front end of the rope-walk are kept in a fixed position viewed in a circular circumferential direction, and rotated about their respective central axes in the same direction of rotation as the direction of rotation of the rear strand ends.

Particularly, inter alia wire ropes are laid up over a core, which is also a strand, extending longitudinally and centrally relatively to the other strands and rotating about its own axis together with the strands behind the bobbin.

Although this known method has been practised for a long time, it has always presented a problem in that it imposes limitations on the length and the mass of the length of rope that can be laid up with it. A particular problem is laying up ropes of both great length and great mass per length. The length of the rope that can be laid up is limited by the length of the rope-walk.

The object of the present invention is to provide a method of laying up ropes, which permits the laying up of ropes of very great length and/or very great mass per length in a relatively simple manner.

This object is achieved in accordance with the invention by laying up the rope by keeping at least a part of the strands behind the strand guide member, which is formed by a lay plate, in a fixed orientation relative to a ground surface, rotating the lay plate and the ends of the strands ahead of the lay plate relatively to the ground about a central axis in the longitudinal direction of the strands, the lay plate and the ends of the strands rotating in the same direction and at the same speed of rotation, and the parts of the strands ahead of the lay plate being supported between the lay plate and the ends of the strands by means of guiding apertures in at least one support member which rotates in the same direction and at the same speed of rotation as the lay plate and the front ends of the strands ahead of the lay plate.

Holding the parts of the strands behind the lay plate, at least a longitudinal portion thereof, in a fixed orientation relative to the ground, makes it possible to rest the finished rope on the ground or, if desired, to wind it on a spool arranged on the ground. Therefore the part of the strands behind the lay plate formed into finished rope does not have to be kept tensioned or rotated in supports. On account of the fact that the parts of the strands between the lay plate and the front attachment points are supported, those parts of the strands need not span the total distance between the lay plate and the attachment points either. By arranging a sufficiently large number of support members, also for the purpose of suspending the strands ahead of the lay plate, a limited tension of the strands will suffice, so that a relatively light, and hence movable, array will suffice. This, in turn, offers the advantage that the maximum length of the rope that can be laid up is no longer dependent on the length of the available rope-walk in a fixed location.

In particular when heavy wire ropes are laid up, a further advantage is provided in that the array can readily be moved in the vicinity of the location where the rope is required, so that any laborious transport of the rope can be kept to a minimum.

A further advantage of the invention is that because the force required for laying up the rope is applied at the location of the lay plate, and not at the location of the attachment point of the end of the length of rope formed, and is passed on through that length of rope formed, the lay length can be controlled more accurately. The disturbing influence induced in the known array by the friction imparted by the finished length of rope to the strands being laid up and torsion of the length of rope formed can thus be avoided.

In a further elaboration of the invention the front ends of the strands are rotated relatively to the lay plate at such a speed of rotation that the orientation of each strand end about its longitudinal axis, relative to the ground, remains the same during rotation about the central axis. This offers the advantage that the strands are laid up without any additional torsional stress.

It is advantageous in laying up heavy stranded rope when the lay plate during laying up is moved forward relatively to the ground and the part of the strands which has been formed into a finished rope is put down on the ground behind the lay plate. This renders a voluminous spool unnecessary and the risk of
the rope being damaged when it is bent during winding is avoided. Further it permits a simple construction of the rear attachment points because during laying up these are kept in a fixed position relative to the ground.

It is important for the quality of a rope that it is laid up accurately with the right constant lay length. The lay length is the length of rope comprising one full winding of strands. To achieve an accurate control of the lay length the rotation of the lay plate can be driven proportionally to the displacement of the lay plate. If the parts of the strands behind the lay plate are put down on the ground, the rotation of the lay plate can be coupled to the displacement of the lay plate relative to the ground. If the parts of the strands behind the lay plate are moved relatively to the ground, then the rotation of the lay plate can be coupled to the displacement of the lay plate relative to the strands.

During laying up the part of the strands ahead of the lay plate, where the support members are arranged, becomes increasingly shorter. The support members should therefore be removed or displaced along the strands. The displacement of the support members can be readily effected by having the lay plate move them along the strands.

Particularly for the purpose of laying up long ropes it is advantageous when the rotation of at least a number of the support members is driven externally, the drive of the support members being coupled to the drive of the lay plate.

Although the support members may be of simple construction, it is advantageous if as few as possible are required. In accordance with a further elaboration of the invention the required number of support members is reduced by virtue of the strands between the support members being passed through guiding apertures in spacers, which are suspended from the strands. Thus a situation is avoided where sagging of the strands in between the support members leads to the strands engaging each other upon rotation about the central axis and intertwine ahead of the lay plate.

The method according to the invention is rendered particularly simple and universally applicable when the displacement of the lay plate and the support members is guided by means of rails on which the attachment points are mounted too. Rails are a widely available guide.

A further object of the invention is to provide an array for carrying out the method according to the invention, comprising, for arrangement in succession in a longitudinal direction, a frame with front attachment points for strands, a frame with a strand guide member and a frame with rear attachment members for strands, the front attachment members being rotatable relatively to the strand guide member about their longitudinal axes and the rear attachment members being rotatable relatively to the strand guide member about a central axis in longitudinal direction.

To this effect the invention provides that the front attachment members are rotatable relatively to their frame about the central axis as well as about their longitudinal axes, the strand guide member constituted by a lay plate is rotatable relatively to its frame, the rear attachment members are mounted on their frame in a fixed orientation about the central axis, and between the lay plate and the front attachment members at least one support frame is arranged, in which a support member is mounted which is rotatable relatively to the frame about the central axis.

To achieve an accurate control of the lay length, the lay plate is preferably provided with driving means for driving the rotation about the central axis and, coupled to it, the displacement of the lay plate in longitudinal direction.

During laying up, the part of the strands ahead of the lay plate, where the support means are arranged, becomes increasingly shorter. For the purpose of displacement of the support means, the support means are preferably adapted to be mobile in longitudinal direction.

Further, at least a number of the support frames are preferably provided with driving means for driving the rotation of the support members about the central axis. This makes it possible to rotate very long strands in parallel about the central axis.

For the purpose of reducing the number of support members required the array may comprise a plurality of spacers which are provided with guiding apertures corresponding to the attachment members. Thus a situation can be avoided where sagging of the strands between the support members leads to the strands' engaging each other upon rotation about the central axis and their intertwining ahead of the lay plate.

To make the use of the array more general, in accordance with a further elaboration of the invention, the frames are adapted to be mobile on rails.

The array according to the invention is particularly easy to transport when adapted for accommodation in a standard container.

It is observed that as regards the laying up of very long ropes it is known per se to lay the rope by rotating relatively to the ground both a strand guide member and the front attachment members of the strands. For this purpose so-called "closer" arrays are used in which spools constitute the front attachment members. The strands are wound on these spools, and during laying up the spools rotate about the central axis and about the axes of the strands.

The complicated construction required for this purpose is extremely expensive particularly when the construction is to have sufficient load capacity for laying up ropes of large mass per length. Laying up a rope with such an array is very inefficient because initially the strands have to be wound on the respective spools, which must then be hoisted into the array by
means of a crane. Due to its large mass the "closer" array makes particularly heavy demands on the foundation, and transporting a "closer" array for laying up a stranded rope on the site is out of the question due to its large mass and overall height. Finally the quality of a length of stranded rope is adversely affected because winding the length of rope newly laid up onto the spool causes tension in the rope.

Hereinbelow one embodiment of the invention will be further explained and illustrated, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a side-elevational view of the lay-up array according to the invention, with strands assembled in it for a rope to be laid up, and Fig. 2 is a side-elevational view according to Fig. 1 after the laying up of the rope has been completed.

The lay-up array according to the embodiment shown is arranged on rail track 1. Connected to a frame 2, which during the laying up of a rope 3 is anchored relatively to the rails by means of an anchoring member 4, are rear attachment members 5 in a fixed orientation relative to a central axis in the longitudinal direction of the rails 1. These attachment members are moveable in a vertical direction by means of a pivoting arm 6 onto which the attachment members are mounted for pivoting movement about a horizontal axis extending transversely to the rail 1.

Mounted onto a mobile frame 7 for rotational movement about the central axis is a lay plate 8. The lay plate is formed by a disc having guiding apertures therein. The frame can travel along the rails 1 by means of wheels 9. The lay plate 8 is adapted to be driven by an electric motor (not shown), which also drives at least one set of wheels'9. The electric motor is coupled to the wheels 9 and the lay plate 8 in such a way that the rotation of the wheels 9 and the lay plate 8 is carried out in a pre-determined ratio.

Mounted on a tensioning trolley 10 which is mobile along the rails is a frame 11, onto which front attachment members 12 are mounted. The attachment members 12 are connected to a disc 13 by means of swivel bearings 14. The disc 13 can rotate about the central axis and is coupled to an electric motor 15. The electric motor 15, in turn, is coupled to the electric motor of the lay plate 8, so that the disc 13 with the front attachment members 12 rotates at the same speed of rotation as the lay plate 8. The attachment members 12 are also coupled to the electric motor 15, the ratio of transmission being such that they are kept in a fixed orientation relative to the frames 2, 7, and 11. The tensioning trolley is provided with brakes.

Ahead of the tensioning trolley there is an attachment point 16 which is fixed relatively to the rails 1 and intended for a tensioning line 17, used to tension a core 18.

Arranged between the front attachment points 12 and the lay plate 8 are support frames 19 onto which support members 20 are mounted for rotating movement about the central longitudinal axis. The support members 20 are constructed as discs with apertures that correspond to the attachment members 5 and 12. The support members 20 may be coupled to an electric motor which in turn is coupled to the electric motor for rotating the lay plate 8, so that the support members 20 can be rotated at the same speed of rotation as the lay plate 8. The support frames each comprise a set of wheels 21 and collapsible trestles 22.

Reference numeral 23 designates a spacer which, following a support member 20, the lay plate 8 or the attachment members member 12 can be arranged around strands 24, which are to be laid up about the core 18, and the core 18. To that effect the strands and the core are passed through the apertures provided in the spacer.

The array is operated as follows. The strands 24 are mounted between corresponding attachment points onto the attachment members 5 and 12, the strands being threaded through corresponding guiding apertures in the lay plate 8 and the support members 20. A strand 18 functioning as core is tensioned between an attachment point 5 and the fixed attachment point 16 ahead of the tensioning trolley 10 and also threaded through respective corresponding guiding apertures in the lay plate 8 and the support members 20. The tensioning trolley 10 is driven forward, pulled, for instance, by a winch arranged near the attachment point 16, until the strands 24 are sufficiently taut to permit the lay plate 8, the spacer 23, the support members 20 and the attachment members points 12 to be rotated without the strands 24 coming into contact with each other.

The actual laying up of the rope 3 is initiated by starting the motors, which drive the rotation of the lay plate 8, the support members 20 and the attachment points 12. During the laying up of the rope the lay plate 8 is moved forward. Each time the lay plate 8 meets with a support frame 19, the collapsible trestles 22 collapse and the support frame is moved along the strands 24.

As the strands 24 are laid up about the core 18, the ends of the strands 24 at the location of the attachment points 12 move backwards relatively to the front end of the core 18. The tensioning trolley 10, therefore, moves backwards during the laying up of the rope. If a suitable length is chosen for the strands 24 and the core 18, the strands and the core will be in one plane after laying up, as shown in Fig. 2.

The laying up of rope 3 is terminated when the lay plate 8, or in this case the first or leading support frame 19, which has been moved on by the lay carriage, reaches the tensioning trolley. The part of the strands 24 which in that situation still extends through the lay plate and the support members cannot be laid
up to form a rope. This is not a drawback, however, because such parts of the strands 24 in practice can be used to form a splice.

Claims

1. A method of laying up stranded ropes (3), in which a plurality of strands (24) are disposed in substantially parallel interrelationship between front (12) and rear (5) attachment points, the strands being threaded through a strand guide member (7, 8) having guiding apertures therein corresponding to the attachment points (5, 12), the ends of the strands (24) behind the strand guide member (7, 8) being rotated relatively to the strand guide member about a central axis in the longitudinal direction of the strands (24), the ends of the strands (24) ahead of the strand guide member (7, 8) being rotated relatively to the strand guide member about their longitudinal axes in the same direction of rotation as the direction of rotation of the ends behind the strand guide member and the strand guide member during the laying up of the rope (3) being moved from the rear strand ends to the front strand ends, characterized by laying up the rope (3) by keeping at least a part of the strands (24) behind the strand guide member (7, 8), which is formed by a lay plate (8), in a fixed orientation relative to a ground surface, rotating the lay plate (8) and the ends of the strands (24) ahead of the lay plate (8) relatively to the ground about a central axis in the longitudinal direction of the strands (24), the lay plate (8) and the ends of the strands (24) rotating in the same direction and at the same speed of rotation, and the parts of the strands (24) ahead of the lay plate (8) being supported between the lay plate (8) and the ends of the strands by means of guiding apertures in at least one support member (20) which rotates in the same direction and at the same speed of rotation as the lay plate (8) and the front ends of the strands (24) ahead of the lay plate (8).

2. A method according to claim 1, characterized in that the front ends of the strands (24) are rotated relatively to the lay plate (8) at such a speed of rotation that the orientation of each strand end about its longitudinal axis relative to the ground remains the same during the rotation about the central axis.

3. A method according to claim 1, characterized in that during the laying up the lay plate (8) travels forward relatively to the ground, and the part of the strands (24) that has been formed into a finished rope (3) is rested on the ground behind the lay plate (8).

4. A method according to claim 1, characterized in that the rotation of the lay plate (8) is driven proportionally to the displacement of the lay plate.

5. A method according to claim 4, characterized in that the rotation of the lay plate (8) is effected proportionally to the displacement of the lay plate relative to the ground.

6. A method according to claim 5, characterized in that the rotation of the lay plate (8) is effected proportionally to the displacement of the lay plate relative to the strands (24).

7. A method according to claim 1, characterized in that the support members (20) are displaced by moving them along the strands (24) by means of the lay plate (8).

8. A method according to claim 1, characterized in that the rotation of at least a number of the support members (20) is driven externally, the drive of the support members (20) being coupled to the drive of the lay plate (8).

9. A method according to claim 1, characterized in that the strands (24) between the support members (20) are threaded through guiding apertures provided in spacers (23) which are suspended from the strands (24).

10. A method according to claim 1, characterized in that the displacement of the lay plate (8) and the support members (20) is guided by means of rails (1) on which the attachment points (5, 12) for the strand ends are mounted too.

11. Array for carrying out the method according to one of the preceding claims, comprising, for arrangement in succession in a longitudinal direction, a frame (11) with front attachment points (12) for strands (24), a frame (7) with a strand guide member (8) and a frame (2) with rear attachment members (5) for strands (24), the front attachment members (12) being rotatable relatively to the strand guide member (8) about their longitudinal axes and the rear attachment members (5) being rotatable relatively to the strand guide member (8) about a central axis in longitudinal direction, characterized in that the front attachment members (12) are rotatable relatively to the frame (11) about the central axis as well as about their longitudinal axes, the strand guide member formed by a lay plate (8) is rotatable relatively to its frame (7), the rear attachment members (5) are mounted on their frame (2) in a fixed orientation about the central axis, and between the lay plate (8) and the front attachment members (12) at least one support frame (19) is arranged, in which a support member (20) is mounted which is rotatable relatively to the frame (19) about the central axis.

12. Array according to claim 11, characterized in that the lay plate (8) comprises driving means for driving the rotation about the central axis and, coupled to it, the displacement of the lay plate (8) in longitudinal direction.

13. Array according to claim 11, characterized in that the support members (20) are constructed so as to be mobile in longitudinal direction.

14. Array according to claim 11, characterized in that at least a number of the support frames (19) comprises driving means for driving the rotation of the sup-
port member (20) about the central axis.

15. Array according to claim 11, characterized by a plurality of spacers (23) having guiding apertures therein corresponding to the attachment members (5, 12).

16. Array according to claim 11, characterized in that the frames (2, 7, 11, 19) are constructed so as to be mobile on rails (1).

17. Array according to claim 11, characterized in that it can be accommodated in a standard container.

Patentansprüche


2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die vorderen Enden der Litzen (24) relativ zur Legeplatte (8) mit einer solchen Drehgeschwindigkeit gedreht werden, daß die Orientierung eines jeden Litzenendes um seine Längsachse relativ zum Boden während der Drehung um die zentrale Achse unverändert bleibt.

3. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß während des Herstellens die Legeplatte (8) relativ zum Boden vorwärts bewegt wird und daß der Teil der Litzen (24), der zu einem fertigen Seil (3) ausgebildet worden ist, auf dem Boden hinter der Legeplatte (8) abgelegt wird.

4. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Drehung der Legeplatte (8) proportional zur Verschiebung der Legeplatte betrieben wird.

5. Verfahren nach Anspruch 4, dadurch gekennzeichnet, daß die Drehung der Legeplatte (8) proportional zur Verschiebung der Legeplatte im Verhältnis zum Boden bewirkt wird.


7. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Stützteile (20) verschoben werden indem sie längs der Litzen (24) mit Hilfe der Legeplatte (8) verschoben werden.

8. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Drehung von wenigstens einer Anzahl der Stützteile (20) extern angetrieben wird, wobei der Antrieb der Stützteile (20) an den Antrieb der Legeplatte (8) angekoppelt ist.

9. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Litzen (24) zwischen den Stützteilen (20) durch Führungsoffnungen hindurchgeführt werden, die in Abstandshaltern (23) vorgesehen sind, die von den Litzen (24) herabhängen.

10. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Verschiebung der Legeplatte (8) und der Stützteile (20) mit Hilfe von Schienen (1) geführt wird, auf denen die Befestigungspunkte (5, 12) für die Litzenenden ebenfalls angeordnet sind.

11. Anordnung zum Durchführen des Verfahrens nach einem der voranstehenden Ansprüche, mit, in Längsrichtung angeordneter Abfolge,

—— einem Rahmen (11) mit vorderen Befestigungspunkten (12) für Litzen (24),

—— einem Rahmen (7) mit einem Litzenführungsstück (8) und einem Rahmen (2) mit rückwärtigen Befestigungsteilen (5) für Litzen (24), wobei die vorderen Befestigungsteile (12) relativ zu dem Litzenführungsstück (8) um ihre Längsachsen drehbar sind und die hinteren Befestigungsteile (5) relativ zu dem Litzenführungsstück (8) um eine zentrale Achse in der Längsrichtung drehbar sind, dadurch gekennzeichnet,

—— daß die vorderen Befestigungsteile (12) relativ zum Rahmen (11) um die zentrale Achse und auch um ihre Längsachsen drehbar sind,

—— daß das durch eine Legeplatte (8) gebildete Litzenführungsstück relativ zu seinem Rahmen (7) drehbar ist,

—— daß die hinteren Befestigungsteile (5) an
Revendications

1. Procédé de câblage de câbles toronnés (3), dans lequel une pluralité de torons (24) sont disposés dans une disposition pratiquement parallèle entre eux, entre des points d’attache avant (12) et arrière (5), les torons étant passés dans un élément de guidage des torons (7, 8) comportant, à l’intérieur, des orifices de guidage correspondant aux points d’attache (5, 12), les extrémités des torons (24) situées derrière l’élément de guidage des torons (7, 8), étant entraînées en rotation par rapport à l’élément de guidage des torons autour d’un axe central dans la direction longitudinale des torons (24), les extrémités des torons (24) situées devant l’élément de guidage des torons (7, 8) étant entraînées en rotation par rapport à l’élément de guidage des torons autour de leurs axes longitudinaux dans le même sens de rotation que le sens de rotation derrière l’élément de guidage des torons, et l’élément de guidage des torons étant déplacé, pendant le câblage du câble (3), des extrémités arrière des torons vers les extrémités avant des torons, caractérisé en ce que le câblage du câble (3) est effectué : en maintenant au moins une partie des torons (24) située derrière l’élément de guidage des torons (7, 8), qui est constitué par une tête de câblage (8), dans une orientation déterminée par rapport à la surface du sol ; en faisant tourner la tête de câblage (8) et les extrémités des torons (24) situées devant la tête de câblage (8) par rapport au sol autour d’un axe central dans la direction longitudinale des torons (24) ; la tête de câblage (8) et les extrémités des torons (24) tournant dans le même sens et à la même vitesse de rotation, et les parties des torons (24) situées devant la tête de câblage (8) étant supportées entre la tête de câblage (8) et les extrémités des torons par des orifices de guidage dans au moins un élément support (20) qui tourne dans le même sens et à la même vitesse de rotation que la tête de câblage (8) et les extrémités avant des torons (24) situées devant la tête de câblage (8).

2. Procédé selon la revendication 1, caractérisé en ce que les extrémités avant des torons (24) sont entraînées en rotation par rapport à la tête de câblage (8) à une vitesse de rotation telle que l’orientation de chacune des extrémités de toron autour de son axe longitudinal par rapport au sol demeure la même pendant la rotation autour de l’axe central.

3. Procédé selon la revendication 1, caractérisé en ce que, pendant le câblage, la tête de câblage (8) se déplace vers l’avant par rapport au sol, et en ce que la partie des torons (24) qui a été formée en un câble (3) terminé, est laissée sur le sol derrière la tête de câblage (8).

4. Procédé selon la revendication 1, caractérisé en ce que la rotation de la tête de câblage (8) est commandée de façon proportionnelle au déplacement de la tête de câblage.

5. Procédé selon la revendication 4, caractérisé en ce que la rotation de la tête de câblage (8) s’effectue de façon proportionnelle au déplacement de la tête de câblage par rapport au sol.

6. Procédé selon la revendication 5, caractérisé en ce que la rotation de la tête de câblage (8) s’effectue de façon proportionnelle au déplacement de la tête de câblage par rapport aux torons (24).

7. Procédé selon la revendication 1, caractérisé en ce que le déplacement des éléments supports (20) s’effectue le long des torons (24) au moyen de la tête de câblage (8).

8. Procédé selon la revendication 1, caractérisé en ce que la rotation d’au moins un certain nombre des éléments supports (20) est commandée de façon externe ; l’entraînement des éléments supports (20) étant couplé à l’entraînement de la tête de câblage (8).

9. Procédé selon la revendication 1, caractérisé en ce que les torons (24) entre les éléments supports (20) sont passés dans des orifices de guidage disposés dans des écureurs (23) qui sont portés par les torons (24).

10. Procédé selon la revendication 1, caractérisé en ce que le déplacement de la tête de câblage (8) et
des éléments supports (20) est guidé au moyen de rails (1) sur lesquels les points d’attache (5, 12) pour les extrémités des torons sont également montés.

11. Agencement pour mettre en oeuvre le procédé selon l’une quelconque des revendications précédentes, comprenant, disposés de manière successive dans une direction longitudinale : un cadre (11) avec des points d’attache (12) pour des torons (24) : un cadre (7) avec un élément de guidage des torons (8) ; et un cadre (2) avec des éléments d’attache arrière (5) pour les torons (24), les éléments d’attache avant (12) pouvant être entraînés en rotation par rapport à l’élément de guidage des torons (8) autour de leurs axes longitudinaux et les éléments d’attache arrière (5) pouvant être entraînés en rotation par rapport à l’élément de guidage des torons (8) autour d’un axe central dans une direction longitudinale, caractérisé en ce que les éléments d’attache avant (12) peuvent être entraînés en rotation par rapport au cadre (11) autour de l’axe central aussi bien qu’autour de leurs axes longitudinaux, en ce que l’élément de guidage des torons, constitué par une tête de câblage (8), peut être entraîné en rotation par rapport à son cadre (7), en ce que les éléments d’attache arrière (5) sont montés sur leur cadre (2) dans une orientation déterminée autour de l’axe central, et en ce qu’au moins un cadre support (19) est disposé entre la tête de câblage (8) et les éléments d’attache avant (12), dans lequel un élément support (20) est monté, qui peut être entraîné en rotation par rapport au cadre (19) autour de l’axe central.

12. Agencement selon la revendication 11, caractérisé en ce que la tête de câblage (8) comprend des moyens d’entraînement pour provoquer la rotation autour de l’axe central et, coupler à cette rotation, le déplacement de la tête de câblage (8) dans la direction longitudinale.

13. Agencement selon la revendication 11, caractérisé en ce que les éléments supports (20) sont construits de manière à être mobiles dans la direction longitudinale.

14. Agencement selon la revendication 11, caractérisé en ce qu’au moins un certain nombre des cadres supports (19) comportent des moyens d’entraînement pour provoquer la rotation des éléments supports (20) autour de l’axe central.

15. Agencement selon la revendication 11, caractérisé par une pluralité d’écarteurs (23) comportant, à l’intérieur, des orifices de guidage correspondant aux éléments d’attache (5, 12).

16. Agencement selon la revendication 11, caractérisé en ce que les cadres (2, 7, 11, 19) sont construits de manière à être mobiles sur des rails (1).

17. Agencement selon la revendication 11, caractérisé en ce qu’il peut être logé dans un conteneur standard.