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(54) Rotor for cable-making machine.

(57) There is proposed a static closer in which the torque on the cable (9),formed by compacting wires or elementary strands,is applied through a rotating curved channel (1) subjected to two rotations:one point by point in each proper zone about its curvilinear axis and one general of the whole channel (1) about the revolution central axis, that is the axis along which the cable (9) is disposed at the compacting point (10). The channel (1) receives its motion about its curvilinear axis epicycloidally because of the general revolution movement and consists of a plurality of channel sections (3) kinematically connected to each other and rotatably supported on a trellis.

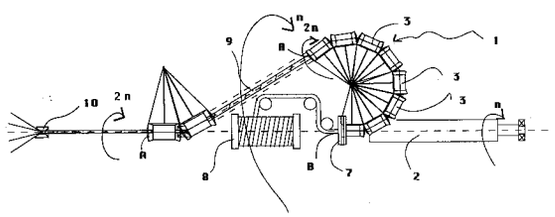

Figura 1

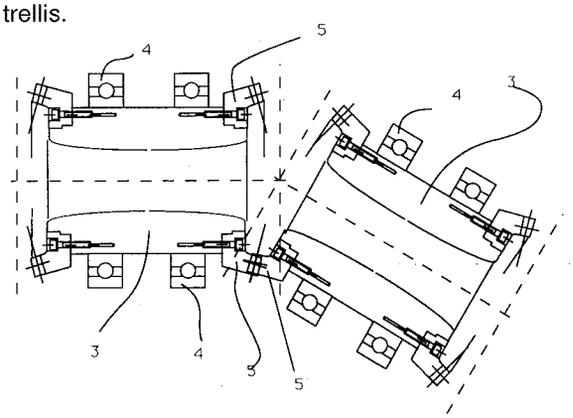

Figura 2

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The present invention relates generally to a cable forming machine and in particular to a light-rotor static closer.

In the static twisting process, wires or strands coming from supply cops mounted on a fixed support or gage are converged to a compacting point while downstream of this point a torque is applied to the cable which is transmitted along the cable up to the point where the wires or strands are converged and compacted, twisting them.

In the known statistic twisting machines (or closers) there are contemplated devices designed to allow the cable to be formed by joining wires or elementary strands outside the machine and therefore to give substantially the compacting wires or strands the final configuration before being absorbed in the closer.

Such devices are suitable only for helping the cable to rotate about its axis along the path of the machine in order to avoid that it is braked during rotation and thus maintaining a relative motion between parts of the machine

(substantially rotating members normally called fliers) and the cable itself. This is particularly important especially when using materials for cables which are unable to transmit sufficient elastic torques capable of overcoming the support reactions and frictions caused by them along the path of the cable itself.

An intrinsic drawback of the above-mentioned known device is that they require to rotate the cable through members substantially rotating at the same velocity of the cable and which at the same time transmit to the cable a suitable tensile stress state in the section of cable coming from the source i.e. the compacting point and allows the section of the cable downstream from such rotating member, to have the minimum tensile stress on the cable necessary to overcome the longitudinal frictions caused by support reactions distributed along the path of the cable.

This tensile stress in the terminal portion of the cable path is usually generated in the takeup area through suitable means generally but not necessarily located in the cable end collection area.

The force at stake for maintaining the tensile stress states in the section of the cable comprised between the source and the point at which stretch and torsion members are located male said members extremely heavy as compared with the cable handled by them and, as they are forced to rotate rigidly with the cable for mechanical reasons of congruence between cable and stretch/torsion members, if follows that the use of such rotating members is very dangerous, this being one of the main and serious problems to be solved.

The present invention has for its object to overcome the above-mentioned drawbacks of the prior art closers.

This object is reached by a light-rotor static closer having the features set forth in claim 1.

Advantageous aspects of the invention are set forth in the subclaims.

The invention is based on the underlying idea of creating for the cable a rotating environment located preferably, but not necessarily, in the portion of the cable path in which the cable has to invert its advancing direction to be laid on the takeup bobbin and such as not only to help the cable in rotating about its axis but to force it to rotate by giving at its periphery the necessary revolving speed in a "natural" way and transmitting the rotation to the point of compacting the wires or elementary strands thus obtaining the desired cord.

Through the twisting device according to the invention the problem of rotating the cable without the use of heavy and dangerous rotating means is solved, since the cable is anyhow forced to rotate about its axis is also in presence of strong support reactions.

In order to better understand the invention reference is made to the attached drawings wherein :

- Fig. 1 is a schematic representation of a rotating channel, light-rotor static closer according to the invention ;
- Fig. 2 illustrates the arrangement of some channel sections kinematically connected each other ;
- Fig. 3 is a schematic longitudinal sectional view of one of the channel sections of fig.2; and
- Fig. 4 is a schematic representation of an arrangement which is a further development of the closer of fig. 1.

Referring now to the mentioned figures in detail, numeral reference 1 indicates the guide channel whose longitudinal axis is is curved substantially in the form of a "question mark".

The bending radius, of course, depends upon the diameter of the cable.

The channel is divided into elementary sections 3. Each section is realized in the form of a tube (fig.2) supported at its ends by means of bearings 4 e.g. ball bearings.

Adjacent channel sections are connected each other by means 5 capable of transmitting rotation between subsequent sections with such a convergence angle as necessary for obtaining the desired arcuate configuration of the channel.

In the embodiment illustrated in fig. 2, motion is transmitted through conical toothed wheels, but a suitable flexible, coupling and the like could be used as well.

The inner surface of the channel (fig.3) is preferably covered by an epoxy resin coating 6 (of the type used e.g. in drawplates, guides for chains,

etc) and having each portion corresponding to each channel section shaped substantially like a revolution surface. It is constructed in such a way that the generating line in contact with the cable 9 corresponds necessarily to the configuration assumed by the cable.This is obtained by taking the portion of the plane line shaped like the natural path of the cable and comprised between the two ends of the channel section and considering this portion of line as the generating line with which the desired surface necessary for the cable can be constructed by revolution about the axis of the channel section.

The channel sections are mounted consecutively on the machine member (not shown) for supporting the cable by disposing them on a trellis (not shown) rigidly connected with a rotor 2 which rotates it.

The curved channel so formed is moved epicycloidally by the machine member itself if the end B, of the succession of channel sections, oriented toward the cable takeup area, is fixed, through lock means 7, to a point having a differential motion capable of making the tip speed of the channel section generating line in contact with the cable equal to the (rotation) tip speed of the cable (cable and channel section necessarily have different diameters).

These differential lock means may consist simply in a clutch.

The channel described above is preferably, but not necessarily, inserted in a section of the cable path where the cable itself has to invert, with respect to an absolute observer, the direction of its longitudinal motion, i.e. in the area where the cable coming from the source inverts its advancing direction in order to be laid on the takeup bobbin 8 or given up to a pull group which does not rotate with the cable.

In fig.4 there is illustrated another advantageous arrangement of a light-rotor static closer according the present invention, based on the rule of the "external linkage of double twisters" and carried out by arranging a rotating channel (1a) at the inlet and one (1c) at the outlet along the path of the cable, both linked with an intermediate one (1b) and in which arrangement the pull can be exerted on the cable by machine members not rotating with the same revolution motion of the cable while the twist is impressed by the channel itself.

In fact, according to the double twist principle, at B the cable does not rotate and therefore it is possible to insert a suitable static pull group 11 which does not revolve about the axis of the cable.

This static pull group can be e.g. a simple or double capstan, an axial caterpillar or a multiroll.

Dimensions of the arrangement depend upon the width of the compacted cable in the area of the critical stress (left hand portion of the drawing in fig. 4) and upon dimensions of the bobbin in the area adjacent to takeup and pull means 8 (right hand portion of the drawing). In the figure, in particular, the pull is exerted by a takeup bobbin 8.

The above-described closer operates as follows.

The cable coming from the compacting point 10 is passed through the guide channel.

The channel being curved, the cable settles along a geodetic line and therefore along a generating line of the channel itself and which represents a stable path for the cable.

Upon rotation of the trellis through known and conventional means, the guide channel revolves with it about the axis along which the cable is disposed at the compacting point, called revolution central axis, and, having its end B constrained, the channel will rotate also about its axis as indicated in fig.1.

If n is the revolution speed of the trellis, the speed at which the free end A of the channel revolves about its axis is 2n according to the double-twist principle, so that at the outlet end B the cable is stationary and therefore can be taken up.

During its rotation the cable does not slide along the support on the generating line of the guide channel, but it is made rolling along the internal perimetric edge of the channel, while the torsion-vector is transmitted in a complete way.

Thus the invention fully achieves the above-mentioned object. In fact the rotating channel according to the invention forces the cable to rotate about its own axis also in presence of strong support reactions. With this device it is possible to realize a static closer which does not need heavy stretch and torsion, rotating members mentioned at the outset, located between the source and take-up station.

Naturally several variations all falling within the inventive concept are possible.

In particular, it is possible to realize the channel through a flexible tube made with compound material using the same technique as in the construction of flexible hollow shafts.

Moreover, in order to further reduce the longitudinal sliding friction, the known system of three pulleys arranged at 120 degrees and connected each other to allow longitudinal skidding of the cable may be used.

Finally, if desired, the portion of the path represented with dashed line can be channelized in order to have the end A of the channel on the revolution central axis as indicated in fig.1, still maintaining the kinematic ratio between the two ends of the channel as required by the double twist principle.

Claims

1. Light-rotor static closer of the type in which the cable is stranded by applying to it a torsion which is transmitted along the cable up to the point where the wires or strands are compacted which is located outside the closer, and including :
   - means for applying said torsion,
   - means for transmitting to the cable a stretch necessary to pull it out from the device for compacting wires or strands, and
   - means for cable treatment and take-up,

   characterized in that said torsion means comprise a substantially tubolar channel having its center axis substantially curvilinear shaped in the form of a question mark in its longitudinal development, arranged substantially parallel and concentric to the cable path and housing the cable inside it, said channel being dragged in the general motion of the cable path and being subjected to two motions: a rotation about its curvilinear central axis and a revolution about the axis, along which the cable is disposed at the compacting point called revolution central axis, these two motions being regulated in such a way that for each revolution of the channel about the revolution central axis there are two corresponding complete revolutions of the channel free end,which is in the inlet of the cable.

2. Closer according to claim 1, characterized in that said channel consists of a plurality of tubular sections mounted consecutively on a rotating trellis in such a way as to configure a question mark pattern and supported on bearings, each of said tubular sections being kinematically connected with the next one through means for transmitting rotation and such as to allow a convergence angle between two adjacent sections.

3. Closer according to claim 2,characterized in that said rotation transmitting means consist in a pair of conical toothed wheels.

4. Closer according to claim 1,characterized in that the end of the channel at the outlet of the cable is fixed to a point having a differential motion capable of making the tip speed of the channel internal generating line in contact with the cable equal to the (rotation) tip speed of the cable itself.

5. Closer according to claim 4,characterized in that said fixing of the channel end at the outlet of of the cable is realized through a clutch.

6. Closer according to the preceding claims,characterized in that between the compacting point and said rotating channel there is disposed a group comprising:
   - a second rotating channel identical to the first mentioned rotating channel and likewise oriented,
   - a static pull group located at the outlet of said second channel,and
   - a third rotating channel identical to the second one,located at the outlet of said pull group and in a position symmetrical to the second channel with respect to said central revolution axis in such a way to configure substantially an S,said second and third channels being provided with a unique revolution about said revolution central axis,said revolution having the same sense and velocity of the revolution of the first mentioned channel.

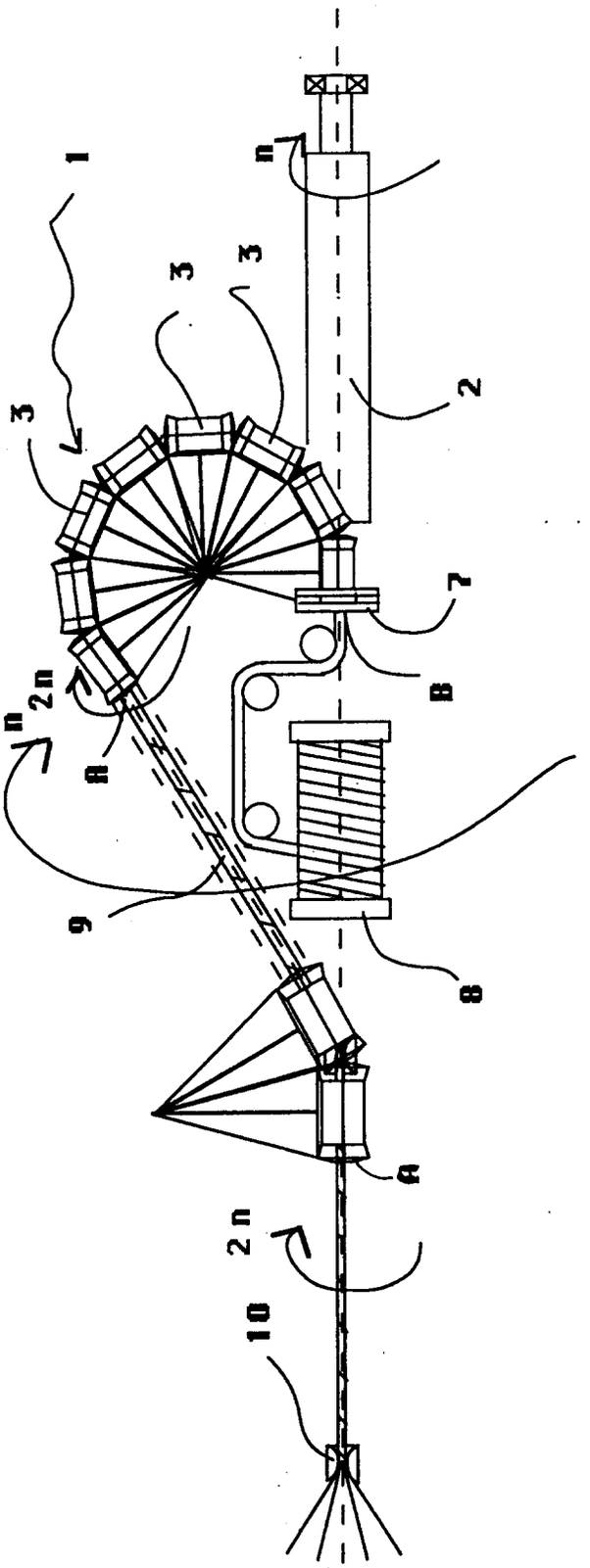

Figura 1

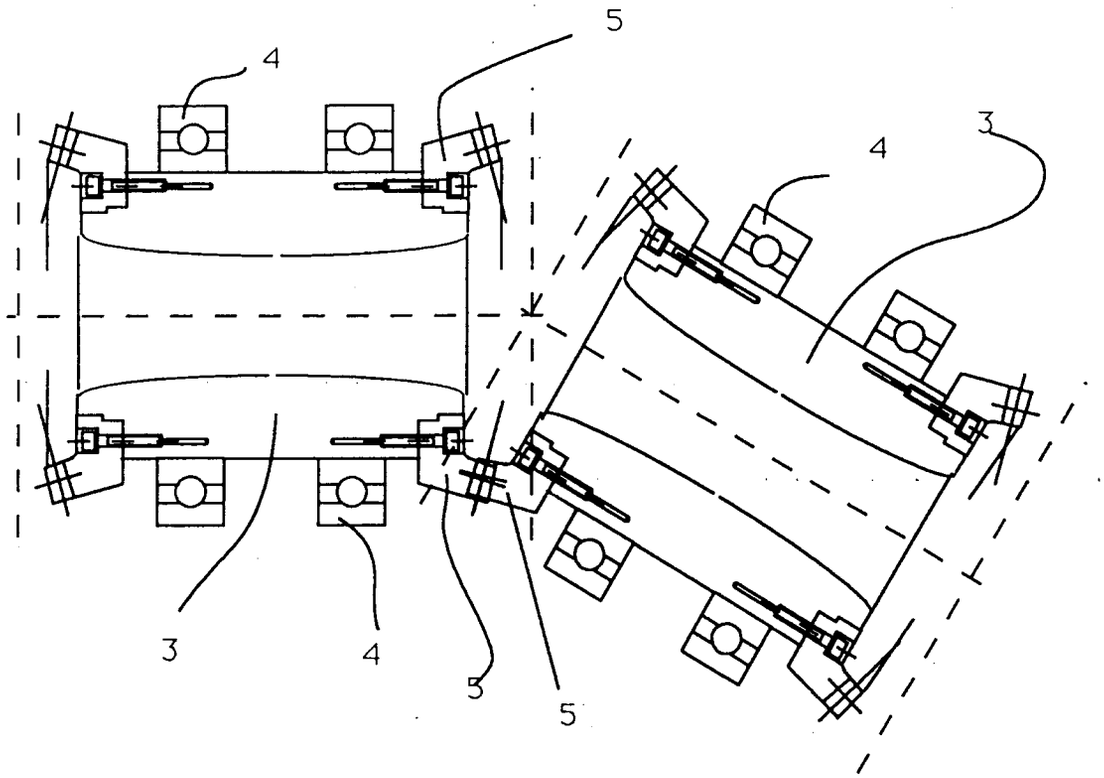

Figura 2

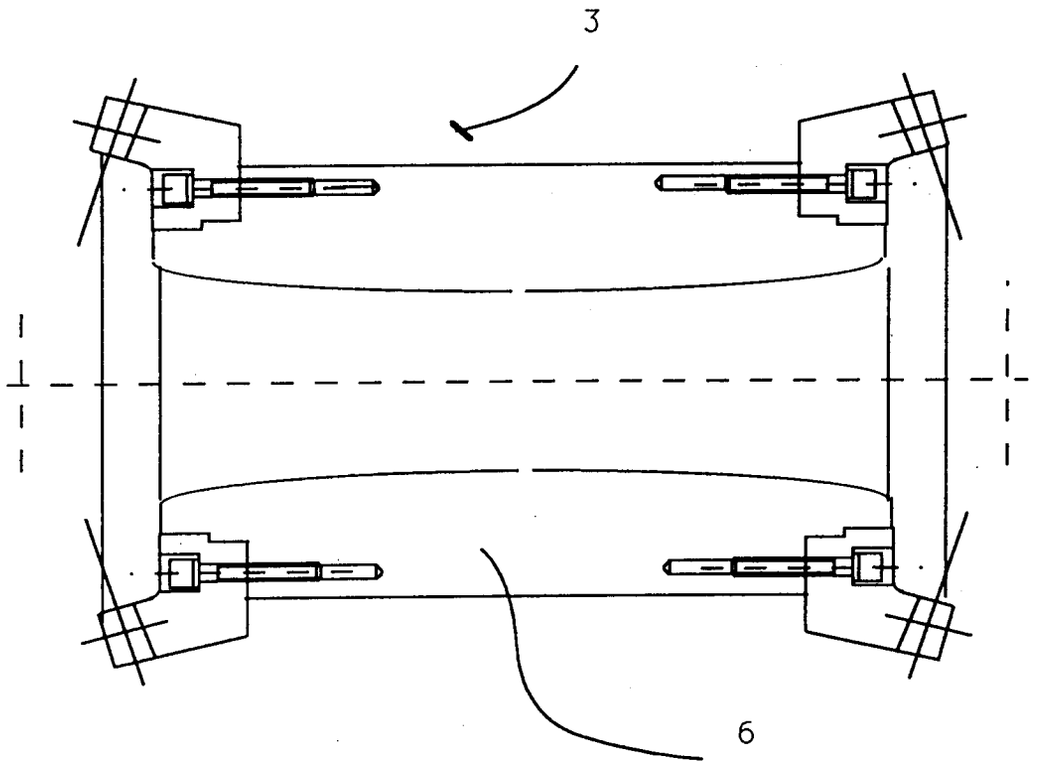

Figura 3

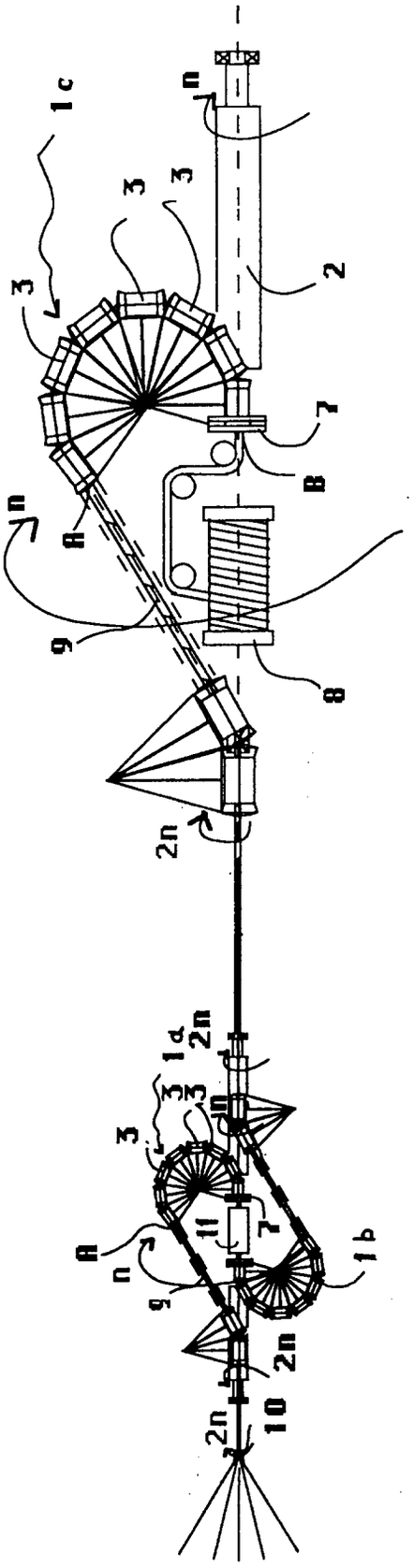

Figura 4

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EUROPEAN SEARCH REPORT

Application Number
EP 93 10 4997

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	EP-A-0 461 844 (CORTINOVIS S.P.A.) * column 3, line 21 - column 4, line 26 * * column 5, line 16 - line 36 *	1,2,4	D07B3/10 D07B3/00
A	DE-C-668 371 (A.KRAFT) * page 2, line 35 - line 40 * * page 2, line 63 - line 65 *	3	
A	EP-A-0 397 053 (YAZAKI CORPORATION) * column 5, line 42 - column 7, line 29 *	6	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

D07B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	08 JULY 1993	GOODALL C.J.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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