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(54) Method for packaging toroidal reels of long elements by binding with binding ties

(57) A method for binding a reel (1), having the shape of a toroidal ring (4), of a wound up long element (2), such as a tube, a cable or a wire, using a binding tie (3)

which connects to the toroidal ring (4) in a single coil (5), where the single coil (5) is wound around the toroidal ring (4) in helical fashion. A reel (1) obtained with said method is also an integral part of the invention.

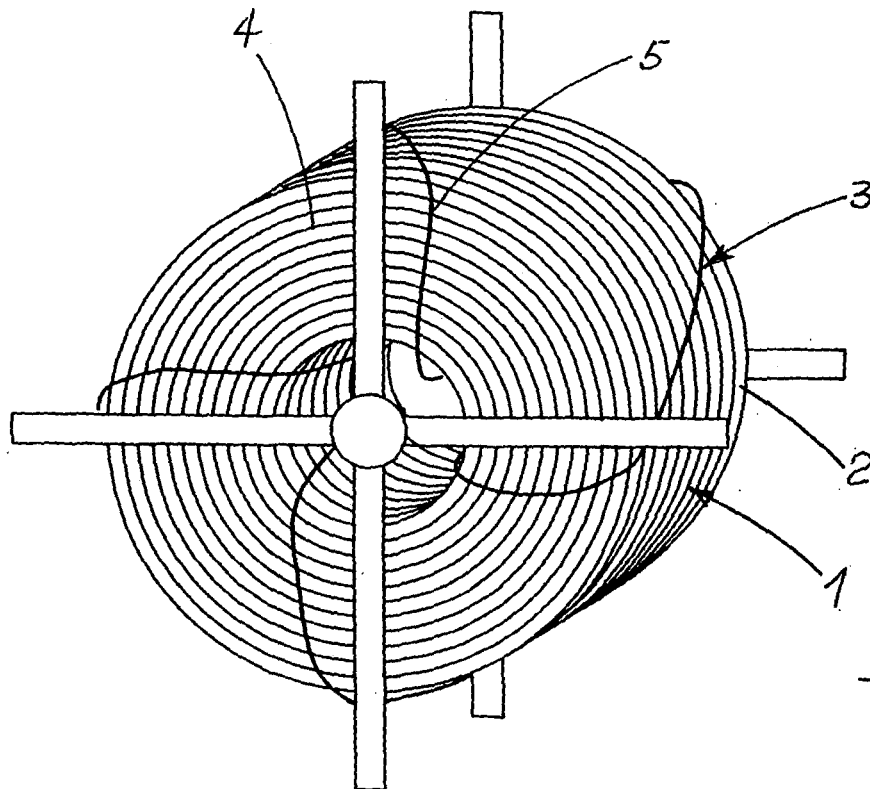


FIG. 1

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Description

[0001] The present invention relates to the packaging of long, flexible elements such as tubes or cables, wound up in the form of toroidal reels, held by binding with a strap; and more particularly it relates to a binding method for said packaging.

[0002] To package the above-mentioned long flexible elements in ring-shaped reels there are known packaging machines which form the reel and bind it to stabilise all of the coils with one or more strap loops.

[0003] The strap loops are usually formed on the reel in such a way that each connects to all of the coils of the long element substantially lying in planes radial to the coils, which are separate for each binding loop and are transversal to the plane in which the reel lies.

[0004] Therefore, with said binding technique the strap loops are created independently of one another and are distributed at regular intervals along the circumference of the torus which constitutes the reel.

[0005] In general, the tie spacing, that is to say, the number of ties necessary to package different types of reel varies according to the dimensions of the reel and the nature of the long elements to be bound.

[0006] As regards the latter aspect, obviously the rigidity of the long element has a significant effect on the stability of the final shape of the bound reel, that is to say, it affects the level of difficulty forming the reel and the number of ties needed to give a definitive reel with a relatively stable shape.

[0007] In other words, long elements with a relatively rigid core, such as electrical cables, allow the production of toroidal reels with a very stable shape, even in the presence of a relatively small number of binding loops.

[0008] In contrast, the packaging in a reel and binding of plastic tubes, without a core, is more problematic.

[0009] The packaging of corrugated plastic tubes is even more of a problem. In such a case, the high level of flexibility of these products significantly affects the packaging cycle, which on one hand is carried out at relatively low tube feed speeds and on the other hand requires a large number of ties to make the toroidal reel of corrugated tube sufficiently stable.

[0010] Therefore, in general, packaging machines which package long elements require as many operating heads as there are ties to be applied to the reel; and they operate with a tube feed speed which is lower the lower the resistance to bending of the tube being packaged.

[0011] Since such packaging machines are normally included in continuous production lines for the flexible element, when this happens, to prevent the reduced operating speed of the packaging machine from having a negative effect on the apparatuses which precede it along the tube production line, slowing them down as well, solutions using packaging machines in which all of the binding heads operate simultaneously are often employed. Operation of all the heads is synchronised, so that during packaging the optimum production rate for

the tube production line can be maintained.

[0012] However, the presence of such a plurality of binding heads leads to several disadvantages.

[0013] Obviously, an increase in the number of binding heads means: a multiplication of costs; more complicated packaging machine construction; more complicated construction and management of the apparatuses which interface between the packaging machine and the production line; these things generally causing high costs, low reliability and large overall dimensions of the packaging machine as a whole.

[0014] Another important disadvantage, particularly evident in the case of reels of corrugated plastic tubes, is a high level of shape instability, obvious during reel warehousing operations, when the reels are not handled carefully and delicately.

[0015] When the ties move along the toroidal circumference, losing the initial equal spacing, the reel quite easily tends to lose its initial shape and become quite uncontrollable.

[0016] The aim of the present invention is therefore to overcome the above-mentioned disadvantages by providing a binding method which allows the use, for binding a reel of any size and shape formed by an long element with equally generic rigidity, of a single binding head capable of packaging the whole reel on its own.

[0017] The technical characteristics of the invention according to the above-mentioned aim may be easily inferred from the contents of the claims herein, especially claim 1, and any of the claims that depend, either directly or indirectly, on claim 1.

[0018] The present invention also relates to a reel obtained using the method disclosed.

[0019] The advantages of the invention are more apparent from the detailed description which follows, with reference to the accompanying drawings which illustrate a preferred embodiment of the invention provided merely by way of example without restricting the scope of the inventive concept, and in which:

- Figure 1 is a perspective assembly view of a reel packaged in accordance with the invention;
- Figure 2 is a schematic perspective view of an apparatus for implementing the packaging method.

[0020] With reference to Figures 1 and 2 of the accompanying drawings, a packaging method is described in which a toroidal body, in particular a reel 1, is bound with a binding tie 3.

[0021] The reel 1 has the shape of a toroidal ring 4 and consists of a long flexible element 2, such as a cable, a wire or a tube, and/or in particular a corrugated plastic tube, which while being fed continuously is wound up in successive circular coils.

[0022] The binding tie 3, made of plastic or metal, which may for example consist of a conventional strap, a belt or a metal wire, a thin rope, a cord, etc., connects to the toroidal ring 4 in a single coil 5 which is wound

around the toroidal ring 4 wrapping it in helical fashion.

[0023] The single coil 5 is wound around the toroidal element 4 two or more times. Figure 1 shows a pack in which the single coil 5 is wound around the reel 1 four times.

[0024] As explained in more detail below, Figure 2 shows the single coil 5 wound around the reel 1 only twice: this does not limit the scope of the invention, but is used only for descriptive purposes, deliberately simplified so as to make the present invention more understandable.

[0025] With regard to this, it is also clear that amongst the various possible forms of reel 1 packaging the toroidal ring 4 can also have a plurality of single coils 5 wound around it, overlapping and one after another.

[0026] Returning to Figure 2, it may be seen how the reel 1 packaging method involves the use of an apparatus 16 comprising a support element 6 which consists of a winder. The latter, illustrated in a very schematic way, rotates continuously about its own axis, allowing (in the conventional way) the long element to be wound up, forming the reel 1 which is supported by the winder 6 which passes axially through the inside of the reel.

[0027] To bind the reel 1 with a single coil 5, the method uses a guide channel 7 for the binding tie 3, extending overall between two separate rows 8, 9 of fixed arms 10, radial to the reel 1, connected to the end faces 11, 12 of the reel 1.

[0028] The guide channel 7 is shaped in such a way that it allows the binding tie 3 to be thrown - with a conventional apparatus not illustrated - into the channel 7 and inside said channel to follow a helical path winding around the toroidal reel 1 connected to the support element 6.

[0029] Preferably, the arms 10 connected to the opposite end faces 11, 12 of the reel 1 are angularly offset about the axis of symmetry 13 of the reel 1; and the support element 6, that is to say, the winder, which forms the reel 1, has at least one channel 7 guide section 14, which runs longitudinally to the winder 6 in a helical direction and which is inserted between the ends 15 of two arms 10 respectively belonging to the separate rows 8, 9.

[0030] Obviously, the embodiment of the channel 7 described above is provided by way of example only and does not limit the scope of the invention, since an equivalent alternative embodiment of it can be obtained by making the channel 7 guide section 14, connected to the support element 6, straight, longitudinal to the axis of symmetry 13 of the reel 1 then suitably offsetting the arms 10 which it joins, connected to the opposite end faces 11 and 12 of the reel 1.

[0031] As indicated, in Figure 2 the channel 7 is shown in a simplified form for greater clarity, however, it is obvious that the support element 6 illustrated could comprise a plurality of independent guide sections 14, each connected to a corresponding pair of radial arms 10 respectively belonging to the separate rows 8, 9 of arms 10, thus identifying helical winding paths for the toroidal

ring 4.

[0032] Therefore, the reel 1 can be bound with a single coil 5 which is wound around it a variable number of times depending on the physical and geometrical properties of the long element 2 and according to packaging requirements. It should be noticed that binding always takes place with a single throw of the binding tie 3 irrespective of the number of windings required.

[0033] Figure 2 also shows how, once the binding tie 3 has been tightened on the reel 1 and the winder 2 has been removed from the reel 1 with a movement longitudinal to the axis of symmetry 13 of the reel 1, the bound reel 1 can be freed from the support element 6 and the remaining parts of the channel 7 by a simple movement transversal to the axis of symmetry 13 of the reel 1. Said movement may be a vertical downward movement, as illustrated in Figure 2, or a horizontal movement, transversal to the axis of symmetry 13 of the reel 1, if the reel 1 is supported with its axis of symmetry 13 positioned vertically.

[0034] The packaging method just described achieves the aforesaid aims, also allowing many advantages.

[0035] Amongst them, a first fundamental advantage of the economic and functional type is the possibility of always using a single binding head for packaging.

[0036] The binding obtained with this single head can be achieved with windings more or less close together along the circumference of the toroidal ring 4 which constitutes the reel 1 depending on the characteristics of the various types of packages required or necessary for the various types of long elements 2 produced.

[0037] The single binding head can perform any type of binding, substantially always in the same binding tie throwing time interval: this gives machines which implement the method disclosed the advantage of not having any limiting effect on the production line feed speed.

[0038] Another advantage deriving from the type of binding used is the fact that the winding spacing of the helical coil 5 around the toroidal ring 4 remains strictly constant. Even if there is an accidental variation in the circumferential spacing between two consecutive windings, the coil 5 spontaneously tends to always return to its original spacing.

[0039] This characteristic, which in itself is advantageous for obtaining reels with a very stable configuration with long elements 2 of any structure, has proved extremely effective in packaging corrugated plastic tubes. These reels can maintain their initial packaging configuration unchanged under practically any handling and warehousing condition. This means that the reels 1 can be handled practically never risking loss of their configuration, rapidly, easily and without requiring any special precautions.

[0040] The invention described has evident industrial applications and can be modified and adapted without thereby departing from the scope of the inventive concept. Moreover, all details of the invention may be substituted by technically equivalent elements.

Claims

1. A method for binding a reel (1), having the shape of a toroidal ring (4), of a wound up long element (2), such as a tube or cable or wire, using a binding tie (3) which connects to the toroidal ring (4) in a single coil (5), **characterised in that** the single coil (5) is wound around the toroidal ring (4) in helical fashion. 5
2. The method according to claim 1, **characterised in that** the single coil (5) is wound at least twice around the toroidal ring (4). 10
3. The method according to claim 2, **characterised in that** the single coil (5) is wound repeatedly around the toroidal ring (4). 15
4. The method according to any of the foregoing claims, **characterised in that** it comprises the winding of a plurality of said single coils (5), overlapping, around the toroidal ring (4). 20
5. The method according to the foregoing claims in which the reel (1) is connected to a support element (6) which passes through it axially, **characterised in that** it comprises a guide channel (7) for the binding tie (3), extending between two separate rows (8, 9) of fixed arms (10), the latter being radial to the reel (1), and connected to the end faces (11, 12) of the reel (1); the guide channel (7) being designed to allow the binding tie (3) to follow a helical path winding around the toroidal reel (1) connected to the support element (6). 25 30
6. The method according to claim 5, **characterised in that** the arms (10) connected to the opposite end faces (11, 12) of the reel (1) are angularly offset about the axis of symmetry (13) of the reel. 35
7. The method according to claim 6, **characterised in that** the support element (6) comprises a winder, which forms the reel (1). 40
8. The method according to any of the claims from 5 to 7, **characterised in that** the support element (6) has at least one channel (7) guide section (14), running longitudinally to the element and inserted between the ends (15) of two arms (10) respectively belonging to the separate rows (8, 9). 45
9. The method according to claim 6 or 7 or 8, **characterised in that** the guide section (14) of the channel (7), connected to the support element (6), extends in helical fashion. 50
10. The method according to any of the claims from 5 to 9, **characterised in that** the guide section (14) of the channel (7), connected to the support element (6) extends in linear fashion, longitudinally to the axis of symmetry (13) of the reel (1). 55
11. The method according to any of the claims from 5 to 10, **characterised in that** the support element (6) comprises a plurality of said guide sections (14), each connected to a pair of radial arms (10) respectively belonging to the separate rows (8,9) of arms (10).
12. The method according to any of the claims from 5 to 11, **characterised in that** the support element (6) can be removed from the reel (1) with a movement longitudinal to the axis of symmetry (13) of the reel (1), it being possible to free the reel (1) from the support element (6), after binding with the binding tie (3), by means of a movement transversal to the axis of symmetry (13) of the reel (1).
13. The method according to claim 12, **characterised in that** the support element (6) can be removed from the reel with a horizontal movement, it being possible to free the reel from the support element (6) after binding with the binding tie (3) by means of a vertical movement.
14. The method according to claim 12, **characterised in that** the support element (6) can be removed from the reel with a vertical movement, it being possible to free the reel from the support element (6) after binding with the binding tie (3) by means of a horizontal movement.
15. A reel of tube or wire wound up and held by binding with a binding tie (3), **characterised in that** the tie includes a single coil (5) of binding tie (3) which connects to the toroidal ring (4) of the reel (1), being wound around it in helical fashion.
16. The reel according to claim 15, **characterised in that** the binding tie (3) coil (5) connects several times to the reel toroidal ring (4).
17. The reel according to claim 16, **characterised in that** the connections of the binding tie (3) coil (5) have predetermined circumferential spacings along the circumference of the reel (1) toroidal ring (4).
18. The reel according to any of the foregoing claims, **characterised in that** the long element (2) includes a corrugated plastic tube.

