



- (51) International Patent Classification:
H02G 15/08 (2006.01)
- (21) International Application Number:
PCT/US2014/043154
- (22) International Filing Date:
19 June 2014 (19.06.2014)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
2013-137094 28 June 2013 (28.06.2013) JP
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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: STRING-LIKE BODY AND COVERING TOOL

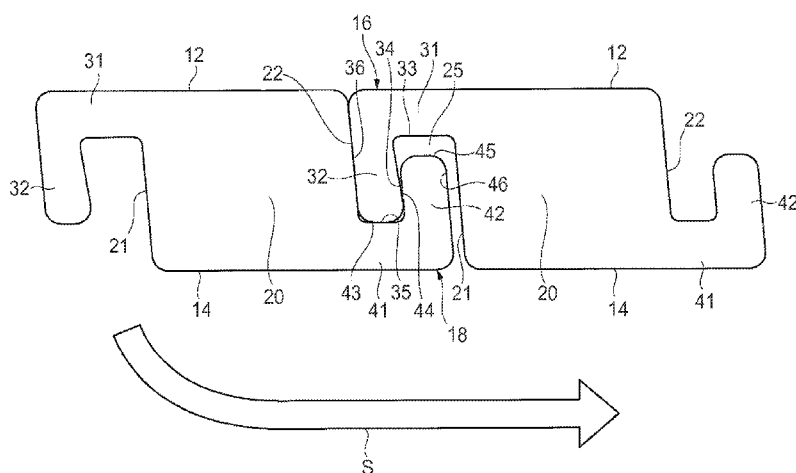


FIG. 3

(57) Abstract: A core ribbon 10 is provided with a string-like body portion 20; a linking portion 31, on a main surface 12 side, extending from string-like body portion 20 toward a side portion 16 side; a first protruding portion 32 extending partway toward a main surface 14 from first linking portion 31; a second linking portion 41, on a main surface 14 side, extending from string-like body portion 20 toward a side portion 18 side; and a second protruding portion 42 extending partway toward a main surface 12 from second linking portion 41. When core ribbon 10 is spirally wound to form a core member 2, first protruding portion 32 is positioned in a second concave portion 24 and second protruding portion 42 is positioned in a first concave portion 23 where a protruding end 45 is separated from a surface 33 of the first linking portion 31.

String-Like Body and Covering Tool

(Field of the Invention)

[0001]

5 The present invention relates to a string-like body used in a core member of a covering tool, and to a covering tool.

(Background Art)

[0002]

10 Conventionally, covering tools are used to waterproof and insulate cable connecting portions such as locations where cables are linearly connected or locations where terminals of cables are terminally connected.

 A covering tool is known that provides a tubular and hollow core member having an unwinding line formed along an entire length, and an elastic tube member held in an enlarged-diameter state on an outer periphery side of the core member (for example, see Patent Document 1).

[0003]

 The core member configuring a portion of such a covering tool is formed by spirally winding a string-like body (core ribbon), which provides respectively on both side portions a protruding portion and a concave portion in which the protruding portion fits, so both side portions are mutually coupled, and can be pulled out as the string-like body. A coupling location of the side portions functions as the unwinding line by pulling out the core member as the string-like body, and the core member can be gradually unwound from one end portion side. Because holding of the elastic tube member by the core member is released in unwound portions, a diameter of the elastic tube member contracts in these portions, and a cable connecting portion is thereby covered by the elastic tube member.

[Prior Art Documents]

[Patent Documents]

30 [0004]

 Patent Document 1: Publication of the International Application in Pamphlet No.

96-24977

[SUMMARY OF THE INVENTION]

[Problems to be Solved by the Invention]

5 [0005]

Here, in the covering tool, when performing a covering process for the cable connecting portion with the elastic tube member, it is desired that the core member holding the elastic tube member in an enlarged diameter is easy to pull out as the string-like body. Meanwhile, it is necessary that the core member has a predetermined holding strength to reliably hold the enlarged-diameter elastic tube member until the covering process is performed so the core member is not prematurely unwound due to core crushing or the like. An example of a configuration of a covering tool that solves these problems is therefore proposed in the covering tool of Patent Document 1, but further improvements are desired.

15 [0006]

The present invention has as an object to provide a string-like body and a covering tool that can easily pull out a core member as the string-like body when unwinding the core member and can have a predetermined holding strength as the core member.

20 [Means to Solve the Problem]

[0007]

The present invention, in one aspect thereof, is a string-like body that has a first main surface and a second main surface that oppose each other and a first side portion and a second side portion, and is a string-like body used in a core member formed to be tubular and hollow by being spirally wound so the first and second side portions are mutually coupled. This string-like body is provided with a string-like body portion whose cross section is substantially square that includes a pair of sides corresponding to the first and second main surfaces; a first linking portion, on a first main surface side, extending toward a first side portion side from the string-like body portion; a first protruding portion extending partway toward the second main surface from the first linking portion; a second linking portion, on a second main surface side, extending toward a second side portion

side from the string-like body portion; and

a second protruding portion extending partway toward the first main surface from the second linking portion. A first surface on a first side portion side of the string-like body portion, a second surface on a second main surface side of the first linking portion, and a third surface on a string-like body portion side of the first protruding portion define a first concave portion. A fourth surface on a second side portion side of the string-like body portion, a fifth surface on a first main surface side of the second linking portion, and a sixth surface on a string-like body portion side of the second protruding portion define a second concave portion. When the core member is formed by spirally winding the string-like body, the first main surface forms an outer peripheral surface of the core member and the second main surface forms an inner peripheral surface of the core member. Moreover, the first protruding portion is positioned in the second concave portion, the second protruding portion is

positioned in the first concave portion in a state where a protruding end on the first main surface side is separated from the second surface of the first linking portion, and a seventh surface positioned on a side of the first protruding portion opposite the string-like body portion and the fourth surface of the string-like body portion are substantially parallel and mutually coupled.

[0008]

In this string-like body, the first protruding portion is positioned in the second concave portion and the second protruding portion is positioned in the first concave portion in the state where the protruding end thereof is separated from the second surface of the first linking portion. In this situation, even if a length of the second protruding portion in the string-like body includes somewhat of an error (displacement) relative to a design value, because a buffering space is provided in advance between the second protruding portion and the first linking portion, the first protruding portion, which is responsible for coupling the string-like body, can be more reliably disposed in a predetermined location of the second concave portion. That is, when forming the core member by spirally winding the string-like body so the first and second side portions are mutually coupled, because a length of the first protruding portion relative to a depth of the second concave portion can be mainly managed and adjusted by this string-like body to

couple the first protruding portion and the second concave portion, it becomes possible to realize uniformity of a coupling force in a coupling location by simpler management.

Then, because uniformity of the coupling force of the string-like body can be provided, a force when pulling out as the string-like body when unwinding the core member can be stabilized, and it becomes possible to manufacture a core member that is easy to pull out. Moreover, because coupling of the side portions of the string-like body is performed with a stable coupling force, the core member is also easily imparted with a predetermined holding strength across an entire length. Moreover, as a result of uniformity of the coupling force of the string-like body being provided and variation in the coupling force being small, mutual coupling of the string-like body in a region transitioning from a tubular and hollow state to a string-like state can be suppressed from becoming weaker than a cutting force generated in a coupling portion of the string-like body, which cutting force is generated by a contracting force of the elastic tube member. By this, core crushing, which is a phenomenon where the elastic tube member contracts due to the string-like body unwinding from a tubular and hollow body in a location unintended by an operator, can be suppressed from occurring.

[0009]

In another aspect, when the core member is formed by spirally winding the string-like body, the third surface of the first protruding portion and the sixth surface of the second protruding portion may be not parallel and it is permissible that only a portion of the third surface and the sixth surface is coupled at an opposing location. In this situation, a holding strength of the string-like body can be further increased, and, because coupling is partial, ease of pulling out can be improved.

[0010]

In another aspect, the first protruding portion may have a widened portion whose width increases heading toward the second main surface from the first main surface. In this situation, the sixth surface of the second protruding portion may tilt to a fourth surface side of the string-like body portion relative to the opposing direction of the first and second main surfaces and, moreover, a first tilt angle of the third surface of the first protruding portion relative to the opposing direction of the main surfaces may be greater than a second tilt angle of the sixth surface of the second protruding portion relative to the

opposing direction of the main surfaces. In this situation, when the first protruding portion is inserted in the second concave portion, because the widened portion of the first protruding portion is engaged with the second concave portion to temporarily fix the two, a coupling process (for example, ultrasonic welding or the like) between the first protruding portion and the second concave portion can be easily performed.

[0011]

In another aspect, an eighth surface on a side of the second protruding portion opposite the string-like body portion and the first surface of the string-like body portion do not have to be coupled. In this situation, coupling of the adjacent first and second side portions is not stronger than necessary, and because the second protruding portion rotates easily when the adjacent string-like body is pulled out on an inner periphery side of the core member, the core member is still further easily pulled out as the string-like body when unwinding the core member.

[0012]

In another aspect, a protruding end on a second main surface side of the first protruding portion and the fifth surface of the second linking portion may be coupled. In this situation, in addition to a coupling region of the fourth and seventh surfaces along the opposing direction of the first and second main surfaces, because a coupling region can be ensured on surfaces along a direction intersecting the opposing direction, resistance is enabled against various forces applied in different directions, and the holding strength when the adjacent first and second side portions are coupled by spirally winding the string-like body can be further stabilized.

[0013]

The present invention, in a separate aspect, is a covering tool that performs a covering process for a connecting portion. This covering tool is provided with a tubular and hollow core member formed by spirally winding the string-like body according to any of the aspects described above so the first and second side portions are mutually coupled and an elastic tube member held in an enlarged-diameter state on an outer periphery side of the core member. In this covering tool, the core member can be pulled out as the string-like body, and at least the fourth surface and the seventh surface are tilted so a surface portion on the first main surface side tilts toward an opposite side of the pullout direction

relative to the opposing direction of the first and second main surfaces. In this situation, because the outer periphery side of a coupling surface tilts to the opposite side of the pullout direction,

when the string-like body is pulled out from an inner periphery of the core member, it is easy to focus a force on an unwinding starting end portion of the coupling surfaces along the opposing direction of the first and second main surfaces, and when unwinding the core member, a pullout operation of the coupled string-like body can be easily performed.

[Effect of the Invention]
[0014]

According to one aspect of the present invention, the string-like body and the covering tool that can easily pull out the core member as the string-like body when unwinding the core member and can have the predetermined holding strength as the core member can be provided.

[Brief Description of the Drawings]
[0015]

FIG. 1 is a perspective view illustrating a covering tool according to the present embodiment.

FIG. 2 is a cross-sectional view of a core ribbon forming a core member of the covering tool illustrated in FIG. 1.

FIG. 3 is a schematic cross-sectional view schematically illustrating a coupling state when side portions of the core ribbon are mutually coupled to form the core member.

FIG. 4 is an enlarged schematic cross-sectional view enlarging a coupling location of the core ribbon illustrated in FIG. 3.

FIG. 5 is a diagram illustrating an example of a pullout force of the core ribbon of the covering tool according to the present embodiment.

FIG. 6A is a cross-sectional view illustrating a separate example of the core ribbon forming the core member, and FIG. 6B is a schematic cross-sectional view schematically illustrating the location where the side portions of the core ribbon are mutually coupled.

FIGS. 7A to 7C are schematic cross-sectional views illustrating modified examples of the core ribbon forming the core member according to the present embodiment.

FIGS. 8A to 8C are schematic cross-sectional views illustrating further separate modified examples of the core ribbon forming the core member according to the present embodiment.

[DETAILED DESCRIPTION]

[0016]

The present embodiment is described in detail while referencing the accompanying drawings. In the explanations of the drawings, identical elements are given the same number, and duplicate explanations are omitted. Moreover, dimensional ratios in each drawing do not necessarily coincide with actual dimensional ratios.

[0017]

FIG. 1 is a perspective view illustrating a covering tool 1 according to the present embodiment. The covering tool 1 is a member used when performing a covering process for a cable connecting portion that is a connecting portion of a cable. As illustrated in FIG. 1, the covering tool 1 is configured including a core member 2 and an elastic tube member 4 held in an enlarged-diameter state on an outer periphery side of the core member 2. Here, the "cable" includes an electric wire or a cable, and the "cable connecting portion" includes not only an aspect that connects one cable to one cable and an aspect that connects a plurality of cables to one cable or to a plurality of cables but also a location where a terminal of the cable is terminally connected.

[0018]

The core member 2 is a cylindrical, tubular, and hollow member having an unwinding line 6 formed on a wall surface along an entire length. The unwinding line 6 is provided so as to progress in a long axis direction while spirally circling around the long axis of the core member 2. In the present embodiment, the unwinding line 6 is a continuous spiral groove provided so as to progress in the long axis direction while spirally circling around the long axis of the core member 2. A resin such as polyethylene or polypropylene, for example, is used as a material of the core member 2. The core member 2 can be pulled out as a core ribbon 10, which is a string-like body, along the

continuous spiral groove that is the unwinding line 6. Although details will be described below, a portion where the continuous spiral groove (unwinding line 6) of the core member 2 is formed is in a shape that is easy to break off.

5 [0019]

Therefore, when the core ribbon 10 is pulled in the illustrated diagonal upper right direction, the core member 2 gradually breaks off at a portion of the unwinding line 6 and is pulled out continuously as a new core ribbon 10. A width of the core ribbon 10 that is pulled out is constant because the unwinding line 6 is formed in the core member 2 at a constant pitch. The core member 2 having the continuous spiral groove that is the
10 unwinding line 6 is manufactured by spirally turning the core ribbon 10 relative to a mandrel; mutually engaging adjacent side portions 16, 18 of the core ribbon 10 (see FIGS. 2, 3); and coupling both side portions by adhesion or welding. The unwinding line 6 is a groove that remains between these coupled side portions 16, 18. Ultrasonic welding, for
15 example, is used as a preferable coupling method.

[0020]

The core member 2 has a first end portion 2A that is a starting end side for being pulled out as the core ribbon 10, and a second end portion 2B that is a terminal end side. The core ribbon 10 unwound from a first end portion 2A side can be pulled out from a
20 second end portion 2B side by passing through an inner side of the core member 2. By pulling out the core ribbon 10 at the second end portion 2B side, the core member 2 is gradually unwound from the first end portion 2A toward the second end portion 2B. In the present embodiment, complete unwinding is possible before reaching the second end portion 2B because the continuous spiral groove that is the unwinding line 6 is formed
25 along the entire length of the core member 2. However, in the core member 2, it is sufficient that the continuous spiral groove is formed in at least a portion that holds the elastic tube member 4 in an enlarged diameter, and there may be a portion in a predetermined range on the second end portion 2B side where the continuous spiral groove is not formed.

30 [0021]

The elastic tube member 4 is a member held in an expanded and enlarged-diameter

state on the outer periphery side of the core member 2 and is a member for covering the cable connecting portion. Ethylene propylene rubber, silicone rubber, or the like, which are insulating rubbers that contract at a normal temperature and excel in elastic characteristics, can be used, for example, as a material of the elastic tube member 4.

5 [0022]

The elastic tube member 4 is held by the core member 2 in the enlarged-diameter state, but a diameter of the elastic tube member 4 at an unwinding portion contracts due to the core ribbon 10 of the core member 2 being pulled out so the core member 2 gradually unwinds. Then, the elastic tube member 4 covers the cable connecting portion by the
10 diameter contracting.

[0023]

Here, a configuration of the core ribbon 10 that is the string-like body configuring the core member 2 will be described in more detail while referencing FIGS. 2 to 4. FIG. 2 is a cross-sectional view of the core ribbon forming the core member of the covering tool described above. FIG. 3 is a schematic cross-sectional view schematically illustrating a
15 coupling state when the side portions of the core ribbon are mutually coupled to form the core member, and FIG. 4 is an enlarged schematic cross-sectional view enlarging a coupling location of the core ribbon. Hatching is omitted in FIGS. 3 and 4 to make description easier.

20 [0024]

As illustrated in FIG. 2, the core ribbon 10 has a first main surface 12 and a second main surface 14 that oppose each other and a first side portion 16 and a second side portion 18, and is a string-like body extending in a longitudinal direction.

A thickness of the core ribbon 10 is about 2 to 3 mm, and, when formed into the
25 core member 2, a core inner diameter is, for example, about 40 to 45 mm. The covering tool provided with the core member of such a diameter is used, for example, to connect a cable whose outer diameter is about 25 to 30 mm, and the like. Note that the thickness of the core ribbon 10 is not limited to a range described above and may be thicker, and the core ribbon 10 may be used to connect a cable of a larger diameter. The core ribbon 10 is
30 provided with a string-like body portion 20, a first linking portion 31, a first protruding portion 32, a second linking portion 41, and a second protruding portion 42. The string-

like body portion 20 is a portion that configures a main portion of the core ribbon 10, exhibits a shape that includes a pair of sides corresponding to the first and second main surfaces 12, 14 and whose cross section is substantially a parallelogram (substantially a square), and is positioned in a center of the core ribbon 10.

5 Surfaces 21, 22 that correspond to another pair of sides of the string-like body portion 20 are tilted so a surface portion on a first main surface 12 side is near a first side portion 16 side relative to an opposing direction of the first and second main surfaces 12, 14. The surfaces 21, 22 are tilted in a mutually parallel state and are tilted, for example, about 5° relative to the opposing direction of the main surfaces 12, 14.

10 [0025]

The first linking portion 31 is a portion whose cross section is substantially rectangular that, on the first main surface 12 side, extends toward the first side portion 16 side from the string-like body portion 20. The first protruding portion 32 is a portion whose cross section is substantially rectangular that extends partway toward the second main surface 14 from an end of this first linking portion 31. The first linking portion 31 and the first protruding portion 32 are conjoined, and a cross section thereof exhibits a substantially L shape. A first concave portion 23 is formed between this first linking portion 31 and first protruding portion 32, whose cross section is substantially L-shaped, and the string-like body portion 20.

20 [0026]

A region of the first concave portion 23 is defined by a surface 21 (first surface) on a first side portion 16 side of the string-like body portion 20, a surface 33 (second surface) on a second main surface 14 side of the first linking portion 31, and a surface 34 (third surface) on a string-like body portion 20 side of the first protruding portion 32. The surface 21 of the string-like body portion 20 and the surface 34, which opposes the surface 21, of the first protruding portion 32 are not parallel, and in the present embodiment, for example, the surface 21 is tilted about 5° relative to the opposing direction of the main surfaces 12, 14 while the surface 34 is tilted about 10° relative to this opposing direction. Meanwhile, the surface 21 of the string-like body portion 20 and a surface 36 (seventh surface) positioned on a side of the first protruding portion 32 opposite the string-like body portion 20 are mutually substantially parallel, and each surface 21, 36, for example,

is tilted about 5° relative to the opposing direction of the main surfaces 12, 14.

[0027]

The second linking portion 41 is a portion whose cross section is substantially rectangular that, on a second main surface 14 side, extends toward a second side portion 18 side from the string-like body portion 20. The second protruding portion 42 is a portion whose cross section is substantially rectangular that extends partway toward the first main surface 12 from an end of this second linking portion 41. The second linking portion 41 and the second protruding portion 42 are conjoined, and a cross section thereof exhibits the substantially L shape. A second concave portion 24 is formed between this second linking portion 41 and second protruding portion 42, whose cross section is substantially L-shaped, and the string-like body portion 20.

[0028]

A region of the second concave portion 24 is defined by a surface 22 (fourth surface) on a second side portion 18 side of the string-like body portion 20, a surface 43 (fifth surface) on a first main surface 12 side of the second linking portion 41, and a surface 44 (sixth surface) on a string-like body portion 20 side of the second protruding portion 42. The surface 22 of the string-like body portion 20; the surface 44, which opposes the surface 22, of the second protruding portion 42; and a surface 46 (eighth surface) positioned on a side of the second protruding portion 42 opposite the string-like body portion 20 are mutually substantially parallel, and each surface 22, 44, and 46, for example, is tilted about 5° relative to the opposing direction of the main surfaces 12, 14. Note that an angle formed by the surface 43 of the second linking portion 41 and the surface 44 of the second protruding portion 42 intersecting is acute.

[0029]

Next, an engagement state when the tubular and hollow core member 2 is formed by spirally winding the core ribbon 10 provided with such a configuration so both side portions 16, 18 are mutually coupled will be described while referencing FIGS. 3 and 4. In this situation, the first main surface 12 forms the outer peripheral surface of the core member 2, and the second main surface 14 forms the inner peripheral surface of the core member 2.

[0030]

When the core member 2 is formed by spirally winding the core ribbon 10, as illustrated in FIG. 3, the first protruding portion 32 is disposed in the second concave portion 24 in a state where a protruding end 35 on a second main surface 14 side of the first protruding portion 32 contacts and is coupled to the adjacent surface 43 of the linking portion 41 of the core ribbon 10. Moreover, in this situation, the surface 36 positioned on the side of the first protruding portion 32 opposite the string-like body portion 20 and the adjacently disposed surface 22 of the string-like body portion 20 of the core ribbon 10 are substantially parallel, contact each other, and are coupled across substantially an entire surface by welding, adhesion, or the like.

[0031]

Meanwhile, the second protruding portion 42 is disposed in the first concave portion 23 in a state where a protruding end 45 on the first main surface 12 side is separated from the adjacent surface 33 of the first linking portion 31 of the core ribbon 10. That is, a buffering space 25 is ensured between the protruding end 45 of the second protruding portion 42 and the surface 33 of the first linking portion 31. Therefore, the protruding end 45 of the second protruding portion 42 and the surface 33 of the first linking portion 31 are not coupled. Moreover, the surface 46 on the side of the second protruding portion 42 opposite the string-like body portion 20 and the adjacent first surface 21 of the string-like body portion 20 of the core ribbon 10 are parallel to each other, but a buffering space 26 is also ensured between the two surfaces 46, 21, which are not coupled to each other.

[0032]

Furthermore, the first protruding portion 32 is a widened portion whose width increases heading toward the second main surface 14 from the first main surface 12, and the surface 34 opposite the second protruding portion 42 is not parallel to the surface 44 of the second protruding portion 42. That is, as illustrated in FIG. 4, while a tilt angle of the surface 44 of the second protruding portion 42 relative to the opposing direction of the main surfaces 12, 14 is α , a tilt angle of the surface 34 of the first protruding portion 32 relative to the opposing direction of the main surfaces 12, 14 is β , and the tilt angle β of the surface 34 is greater than the tilt angle α of the surface 44. For example, if the tilt angle α of the surface 44 is 5° , the tilt angle β of the surface 34 is 10° , and so forth.

However, the tilt angles α , β are not limited to these values; for example, operability is favorable and preferable when forming the core member 2 from the core ribbon 10 with the tilt angle α of the surface 44 set to be 0° or more and 25° or less and the tilt angle β of the surface 34 set to be 5° or more and 30° or less. More preferable is for the tilt angle α of the surface 44 to be in a range of 0° or more and 10° or less and the tilt angle β of the surface 34 to be in a range of 5° or more and 15° or less. Note that it is preferable for the tilt angle β of the surface 34 to be greater than the tilt angle α of the surface 44, but the tilt angle α may be equal to or greater than the tilt angle β .

[0033]

In this manner, the opposing surfaces 34, 44 of the first protruding portion 32 and the second protruding portion 42 are not parallel, the surface 44 of the second protruding portion 42 is acute relative to the surface 43, and, because the first protruding portion 32 has the widened portion, only a portion thereof contacts an opposing location of the surface 34 and the surface 44, and only this contact location is coupled by welding or the like. That is, entire surfaces of the first and second protruding portions 32, 42 are not coupled between the opposing surfaces 34, 44. Note that because the first protruding portion 32 and the second protruding portion 42 have a relationship described above, a welding operation or the like can be easily performed when coupling the side portions 16, 18 of the core ribbon 10 by welding or the like because the first protruding portion 32 can be engaged with and thereby temporarily fixed to the second concave portion 24.

[0034]

Next, an action and effect of the covering tool 1 according to the present embodiment will be described.

[0035]

For example, if the core ribbon is of a shape such as illustrated in FIGS. 2 and 3 of Patent Document 1 (WO 96/24977), there is a situation where the shape of the core ribbon is such that, for example, a length of one protruding portion is longer or shorter than a design value due to an error in manufacturing. In this situation, as illustrated in FIGS. 2 and 3 in Patent Document 1, if the core member is of a type that completely coincides both side portions to engage and couple the side portions, there is a situation where a coupling force varies significantly according to a location on the core member due to a

displacement of the length of one of the protruding portions. That is, there may be variation therein.

[0036]

In contrast, according to the core ribbon 10 provided with the buffering spaces 25, 26 such as illustrated in FIGS. 2 to 4, because the buffering space 25 and the like are provided in advance, even if a length of the second protruding portion 42 fluctuates somewhat, coupling of the first protruding portion 32 and the string-like body portion 20 is hardly affected; therefore, a more uniform coupling force can be provided across an entirety of the core member 2 by managing and adjusting a length of the first protruding portion 32. As a result, the core ribbon 10 can be pulled out with a more stable pullout force. For example, illustrated in FIG. 5 is a result of a test where a sample number n=6 core ribbons 10 of a configuration illustrated in FIGS. 2 to 4 are prepared and assembled into the core member 2 and where the core member is unwound by pulling out the core ribbon 10 as illustrated in FIG. 1.

As a measuring device, a tension and compression tester (STROGRAPH V10-C produced by Toyo Seiki Seisaku-sho, Ltd.), for example, is used. As evident from a result of a pullout force (tension) illustrated in FIG. 5, the pullout force is in a range roughly within 10 [N] across the entire length of the core member 2, and it is determined that the core member 2 can be unwound at a stable pullout force.

[0037]

As described above, in the core ribbon 10, the first protruding portion 32 is positioned in the second concave portion 24, and the second protruding portion 42 is positioned in the first concave portion 23 in a state where the protruding end 45 thereof is separated from the surface 33 of the first linking portion 31. Because of this, even if the length of the second protruding portion 42 in the core ribbon 10 includes somewhat of an error (displacement) relative to the design value, because the buffering space is provided in advance between the second protruding portion 42 and the first linking portion 31, this error can be suppressed from affecting coupling of the side portions 16, 18, and the first protruding portion 32, which is mainly responsible for coupling the core ribbon 10, can be reliably disposed in and coupled to a predetermined location of the second concave portion 24. That is,

when forming the core member 2 by spirally winding the core ribbon 10 so the first and second side portions 16, 18 are mutually coupled, because the length of the first protruding portion 32 relative to a depth of the second concave portion 24 can be mainly managed and adjusted by this core ribbon 10 to couple the the first protruding portion 32 and the second concave portion 24, it becomes possible to realize uniformity of the coupling force in the coupling location by simpler management. Then, because uniformity of the coupling force of the core ribbon 10 can be provided, the force when pulling out as the core ribbon 10 when unwinding the core member 2 can be stabilized, and it becomes possible to manufacture a core member 2 that is easy to pull out.

[0038]

Furthermore, in the core ribbon 10, because coupling of the side portions 16, 18 of the core ribbon 10 is performed with a stable coupling force, the core member 2 is easily imparted with a predetermined holding strength across the entire length. Moreover, as a result of uniformity of the coupling force of the core ribbon 10 being provided and variation in the coupling force being small, mutual coupling of the core ribbon 10 in a region transitioning from a tubular and hollow state to a string-like state can be suppressed from becoming weaker than a cutting force generated in a coupling portion of the core ribbon 10, which cutting force is generated by a contracting force of the elastic tube member 4. By this, core crushing, which is a phenomenon where the elastic tube member 4 contracts due to the core ribbon 10 unwinding from the core member 2 in a location unintended by an operator, can be suppressed from occurring.

[0039]

Furthermore, when the core member 2 is formed by spirally winding the core ribbon 10, the surface 34 of the first protruding portion 32 and the surface 44 of the second protruding portion 42 are not parallel, and only a portion of the surfaces 34, 44 are coupled in the opposing location. Because of this, the holding strength of the core ribbon 10 can be further increased, and, because coupling is partial, ease of pulling out can be improved.

[0040]

Furthermore, the first protruding portion 32 is the widened portion whose width increases heading toward the second main surface 14 from the first main surface 12. Moreover, the surface 44 of the second protruding portion 42 is tilted to the surface 22

side of the string-like body portion 20 relative to the opposing direction of the main surfaces 12, 14, and the first tilt angle β of the surface 34 of the first protruding portion 32 is greater than the second tilt angle α of the surface 44 of the second protruding portion 42. Because of this, when the first protruding portion 32 is inserted in the second concave portion 24, because the widened portion of the first protruding portion 32 is engaged with the second concave portion 24 to temporarily fix the two, a coupling process (for example, ultrasonic welding or the like) between the first protruding portion 32 and the second concave portion 24 can be easily performed.

[0041]

Furthermore, the surface 46 on the side of the second protruding portion 42 opposite the string-like body portion 20 and the surface 21 of the string-like body portion 20 are not coupled. Because of this, coupling of the adjacent first and second side portions 16, 18 is not stronger than necessary, and because the second protruding portion 42 rotates easily when the adjacent core ribbon 10 is pulled out on an inner periphery side of the core member 2, the core member 2 is still further easily pulled out as the core ribbon 10 when unwinding the core member 2.

[0042]

Furthermore, the protruding end 35 of the first protruding portion 32 and the surface 43 of the second linking portion 41 are coupled.

Because of this, in addition to a coupling region of the surfaces 22, 36 along the opposing direction of the main surfaces 12, 14, a coupling region can be ensured on the surfaces 35, 43 along a direction intersecting the opposing direction, resistance is enabled against a force applied in a different direction, and the holding strength when the adjacent first and second side portions 16, 18 are coupled by spirally winding the core ribbon 10 can be stabilized.

[0043]

Furthermore, in the covering tool 1 including the core ribbon 10 described above, the core member 2 can be pulled out in a pullout direction S as the core ribbon 10 (see FIG. 3), and at least the surfaces 22, 36 are tilted so the surface portion on the first main surface 12 side tilts to an opposite side of the pullout direction relative to the opposing direction of the main surfaces 12, 14. In this manner, because the outer periphery side of a

coupling surface tilts to the opposite side of the pullout direction, when the core ribbon 10 is pulled out from the inner periphery of the core member 2, it is easy to focus a force on an unwinding starting end portion of the coupling surfaces 22, 36 along the opposing direction of the main surfaces 12, 14, and when unwinding the core member 2, a pullout operation of the coupled core ribbon 10 can be performed more easily.

[0044]

The present invention is not limited to the embodiment described above and various modifications are possible in a scope that does not depart from the spirit of the present invention.

[0045]

For example, in the embodiment described above, an example of the core ribbon where the thickness of the ribbon is, for example, about 2 to 3 mm is illustrated, but the core ribbon can be made thinner (for example, about 1 to 2 mm). In this situation, as illustrated in FIG. 6 for example, a core ribbon 50 of a more oblong shape can be provided. A basic configuration of the core ribbon 50 is similar to that of the core ribbon 10, has the first main surface 12 and the second main surface 14 that opposed each other, has the first side portion 16 and the second side portion 18, and is a string-like body extending in the longitudinal direction.

[0046]

In this core ribbon 50, tilt angles of surfaces 76, 74, 61, 62, 84, and 86 along the opposing direction of the main surfaces 12, 14 differ from, for example, the core ribbon 10, and the surfaces 76, 61, 62, 84, and 86 are parallel to each other and tilted, for example, about 10° relative to the opposing direction of the main surfaces 12, 14.

Meanwhile, the surface 74 on the string-like body portion 20 side of the first protruding portion 32 is tilted, for example, about 15° relative to the opposing direction.

[0047]

In this manner, in the core ribbon 50, while the tilt angles differ, a first tilt angle β of the surface 74 of the first protruding portion 32 is greater than a second tilt angle α of the surface 84 of the second protruding portion 42, similar to the core ribbon 10. Because of this, in the core ribbon 50 as well, when the first protruding portion 32 is inserted in the second concave portion 24, because the widened portion of the first protruding portion 32

is engaged with the second concave portion 24 so both are temporarily fixed, similar to the core ribbon 10, the coupling process (for example, ultrasonic welding or the like) between the first protruding portion 32 and the second concave portion 24 can be easily performed. Other actions and effects of the core ribbon 50 are similar to when using the core ribbon 10. Note that the tilt angles of the surfaces 76, 74, 61, 62, 84, and 86 along the opposing direction of the main surfaces 12, 14 of the core ribbon 50 are greater than the tilt angles of the surfaces 36, 34, 21, 22, 44, and 46 of the core ribbon 10 because lengths of the protruding portions and the concave portions are ensured by increasing the tilt angles, and by increasing the tilt angles in this manner, the core ribbon can be made thinner while ensuring the length of the protruding portions and the like.

[0048]

Furthermore, the core ribbon according to the present embodiment can be further modified in various ways as illustrated in FIGS. 7 and 8. For example, in a core ribbon 10a illustrated in FIG. 7A, while a surface 22a of the string-like body portion 20 and a surface 36a of the first protruding portion 32 are coupled in a mutually parallel state, tilts thereof are in a reverse direction of those in the core ribbon 10. In this situation, coupling of both side portions 16, 18 of the core ribbon 10a can be made stronger. Moreover, in the core ribbon 10a, surfaces 44a, 46a of the second protruding portion 42 are tilted to an outer side relative to the opposing direction of the main surfaces 12, 14. Note that in a core ribbon 10b illustrated in FIG. 7B, similar to the above, surfaces 44b, 46b of the second protruding portion 42 are also tilted to the outer side relative to the opposing direction of the main surfaces 12, 14.

[0049]

Furthermore, in a core ribbon 10c illustrated in FIG. 7C, while a surface 22c of the string-like body portion 20 and a surface 36c of the first protruding portion 32 are coupled in a mutually parallel state, tilts thereof are reversed from those in the core ribbon 10 (similar to the core ribbon 10a). Moreover, the core ribbon 10c is further formed so a surface 34a of the first protruding portion 32 tilts to the outer side and toward the second main surface 14 from the first main surface 12. In this situation, because coupling between the protruding end 35c of the first protruding portion 32 and the second linking portion 41 is partial, pulling out the core ribbon 10c is easy.

[0050]

Furthermore, in a core ribbon 10d illustrated in FIG. 8A, a linking portion from a surface 22d of the string-like body portion 20 to a surface 43d of the second linking portion 41 is a surface shape including in a portion thereof a curved surface so the linking portion is smooth, and surfaces 36d, 35d of the first protruding portion 32 are smooth curved surfaces that coincide with (are parallel to) this curved surface. In this situation, because there is no location where coupling breaks, a strength of coupling of the surfaces 22d, 36d and a strength of coupling of the surfaces 35d, 43d are more easily made constant.

[0051]

Furthermore, in a core ribbon 10e illustrated in FIG. 8B, a surface 22e of the string-like body portion 20 and a surface 36e of the first protruding portion 32 are surfaces parallel to the opposing direction of the main surfaces 12, 14. Moreover, in the core ribbon 10e, a front end of the second protruding portion 42 is a widened portion. In this situation, because a sensation of fitting the first protruding portion 32 into the second concave portion 24 can be obtained, an operation of engaging the first protruding portion 32 with the second concave portion 24 can be made easier. Moreover, in a core ribbon 10f illustrated in FIG. 8C, a surface 22f of the string-like body portion 20 and a surface 36f of the first protruding portion 32 are surfaces substantially parallel to the opposing direction of the main surfaces 12, 14 and are coupled so a portion thereof has a stepped surface.

In this situation, a step portion improves a coupling strength of a coupling region of the surfaces 22f, 36f.

[0052]

Note that the modified examples described above merely illustrate a portion of the present invention and can be suitably changed within a scope that does not depart from the spirit of the present invention; the present invention is not limited by these embodiments and modified examples thereof, and other modifications are also possible.

[Reference Numerals]

[0053]

1 Covering tool

- 2 Core member
- 4 Elastic tube member
- 10, 10a to 10f, 50 Core ribbon
- 12 First main surface
- 5 14 Second main surface
- 16 First side portion
- 18 Second side portion
- 20 String-like body portion
- 21, 61 Surface (first surface)
- 10 22, 62 Surface (fourth surface)
- 23 First concave portion
- 24 Second concave portion
- 31 First linking portion
- 32 First protruding portion
- 15 33 Surface (second surface)
- 34, 74 Surface (third surface)
- 35 Protruding end
- 36, 76 Surface (seventh surface)
- 41 Second linking portion
- 20 42 Second protruding portion
- 43 Surface (fifth surface)
- 44, 84 Surface (sixth surface)
- 45 Protruding end
- 46, 86 Surface (eighth surface)
- 25 S Pullout direction.

Claims

1. A string-like body that has a first main surface and a second main surface that oppose each other and a first side portion and a second side portion, and is used in a core member formed to be tubular and hollow by being spirally wound so the first and second side portions are mutually coupled, comprising:

a string-like body portion whose cross section is substantially square that includes a pair of sides corresponding to the first and second main surfaces;

a first linking portion, on the first main surface side, extending toward the first side portion side from the string-like body portion;

a first protruding portion extending partway toward the second main surface from the first linking portion;

a second linking portion, on the second main surface side, extending toward the second side portion side from the string-like body portion; and

a second protruding portion extending partway toward the first main surface from the second linking portion;

wherein,

a first surface on the first side portion side of the string-like body portion, a second surface on the second main surface side of the first linking portion, and a third surface on a string-like body portion side of the first protruding portion define a first concave portion;

a fourth surface on the second side portion side of the string-like body portion, a fifth surface on the first main surface side of the second linking portion, and a sixth surface on a string-like body portion side of the second protruding portion define a second concave portion;

when the core member is formed by spirally winding the string-like body, the first main surface forms an outer peripheral surface of the core member and the second main surface forms an inner peripheral surface of the core member;

the first protruding portion is positioned in the second concave portion and the second protruding portion is positioned in the first concave portion in a state where a protruding end on the first main surface side is separated from the second surface of the first linking portion; and

a seventh surface positioned on a side of the first protruding portion opposite the string-like body portion and the fourth surface of the string-like body portion are substantially parallel and mutually coupled.

5 2. The string-like body according to claim 1, wherein, when the core member is formed by spirally winding the string-like body, the third surface of the first protruding portion and the sixth surface of the second protruding portion are not parallel and only a portion of the third surface and the sixth surface are coupled at an opposing location.

10 3. The string-like body according to claim 1 or 2, wherein the first protruding portion has a widened portion whose width increases heading toward the second main surface from the first main surface.

15 4. The string-like body according to any of claims 1 to 3, wherein the sixth surface of the second protruding portion is tilted to a fourth surface side of the string-like body portion relative to an opposing direction of the first and second main surfaces.

20 5. The string-like body according to claim 4, wherein a first tilt angle β relative to the opposing direction of the third surface of the first protruding portion is greater than a second tilt angle α relative to the opposing direction of the sixth surface of the second protruding portion.

25 6. The string-like body according to any of claims 1 to 5, wherein an eighth surface on a side of the second protruding portion opposite the string-like body portion and the first surface of the string-like body portion are not coupled.

30 7. The string-like body according to any of claims 1 to 6, wherein a protruding end on a second main surface side of the first protruding portion and the fifth surface of the second linking portion are coupled.

8. A covering tool that performs a covering process for a connecting portion,

comprising:

a tubular and hollow core member formed by spirally winding the string-like body according to any of claims 1 to 7 so the first and the second side portions are mutually coupled; and

5 an elastic tube member held in an enlarged-diameter state on an outer periphery side of the core member; wherein

the core member can be pulled out as the string-like body, and

at least the fourth surface and the seventh surface are tilted so the first main surface side tilts toward an opposite side of the pullout direction relative to the opposing direction
10 of the first and second main surfaces.

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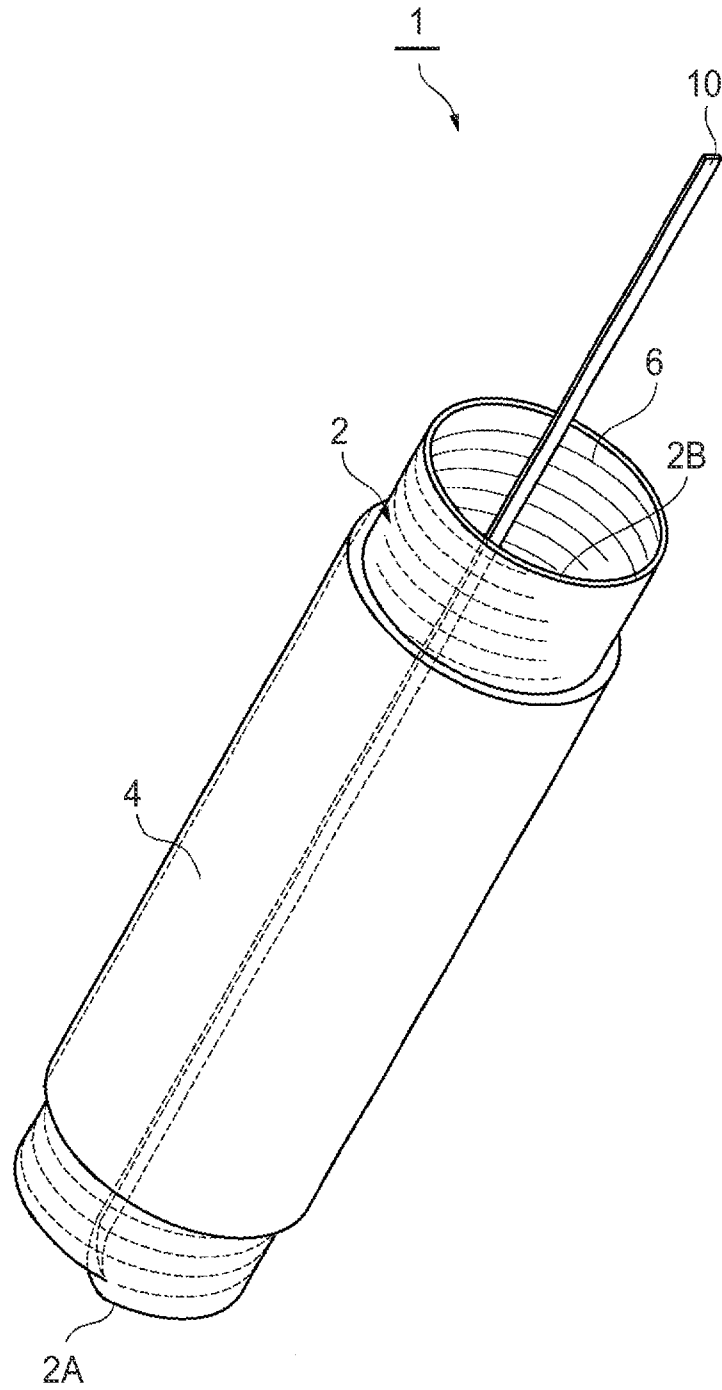


FIG. 1

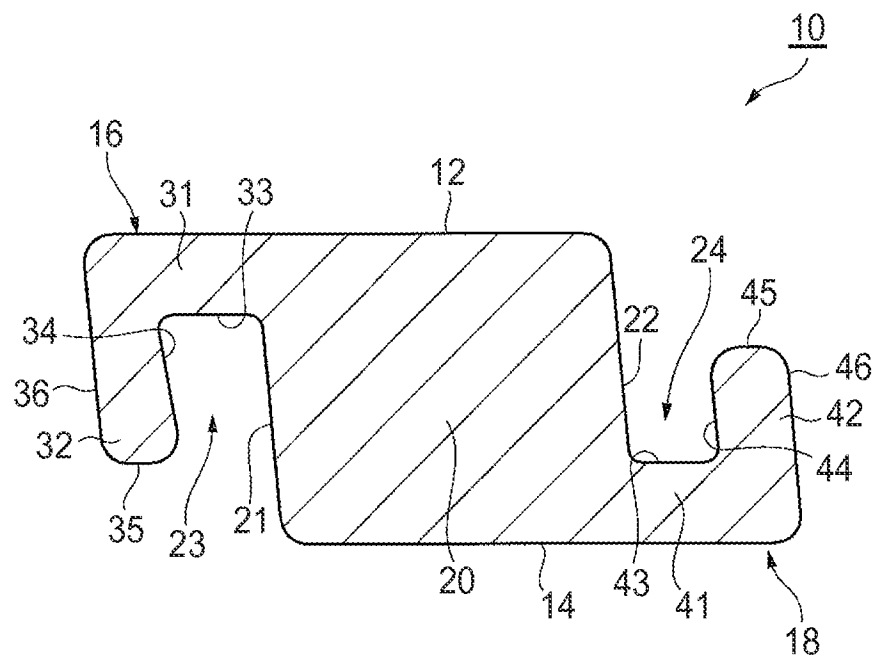


FIG. 2

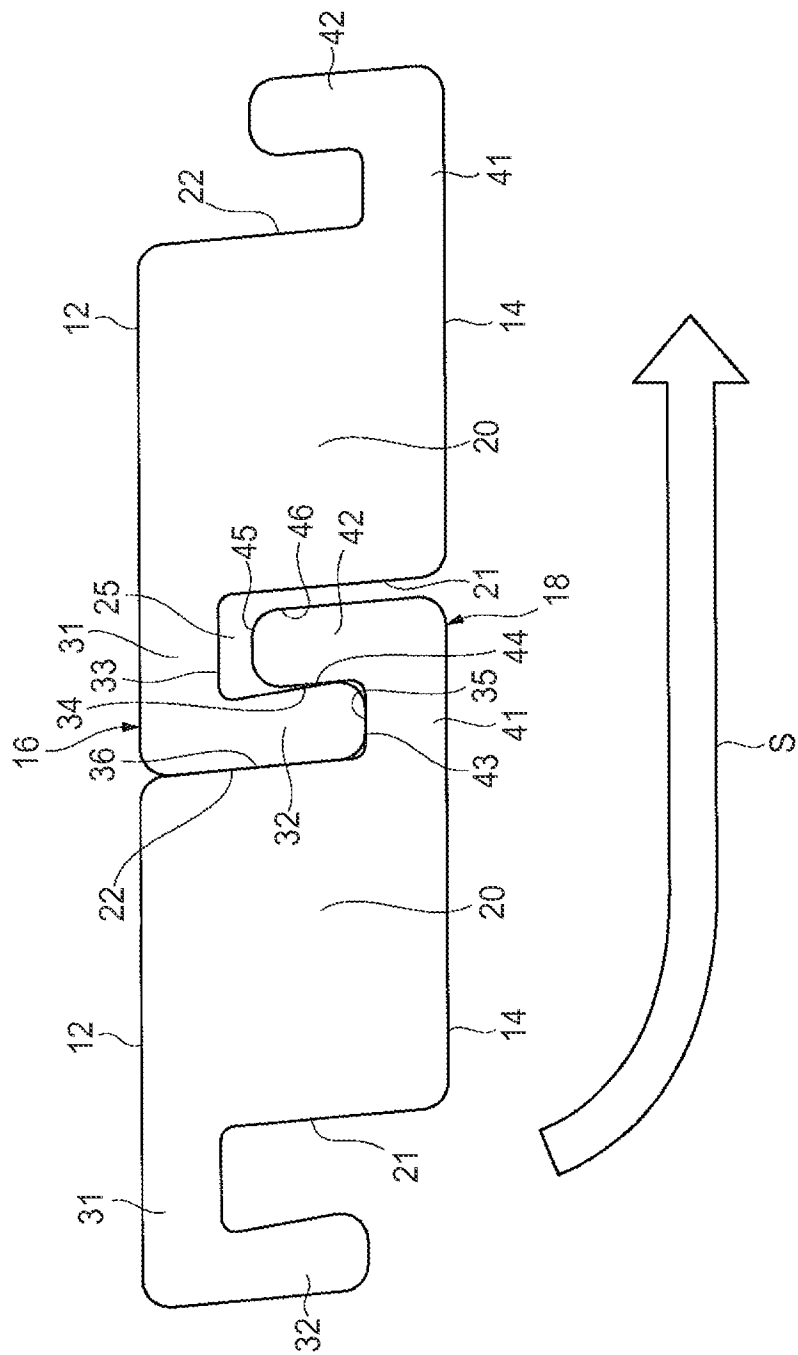
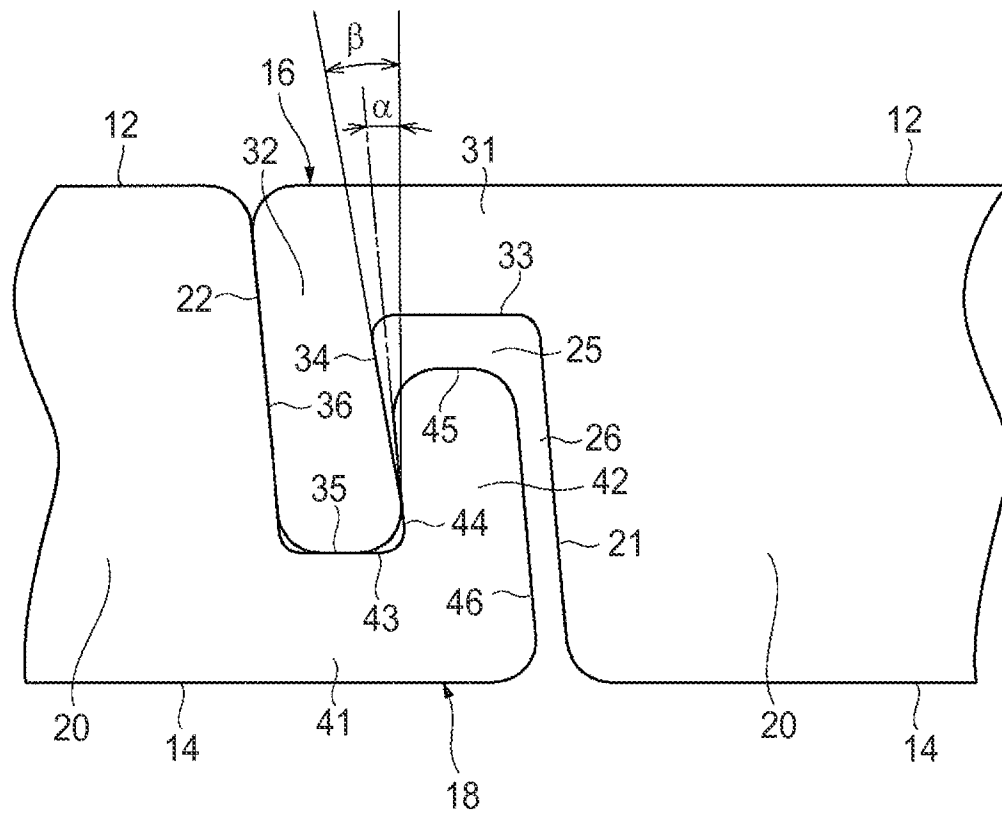


FIG. 3

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*FIG. 4*

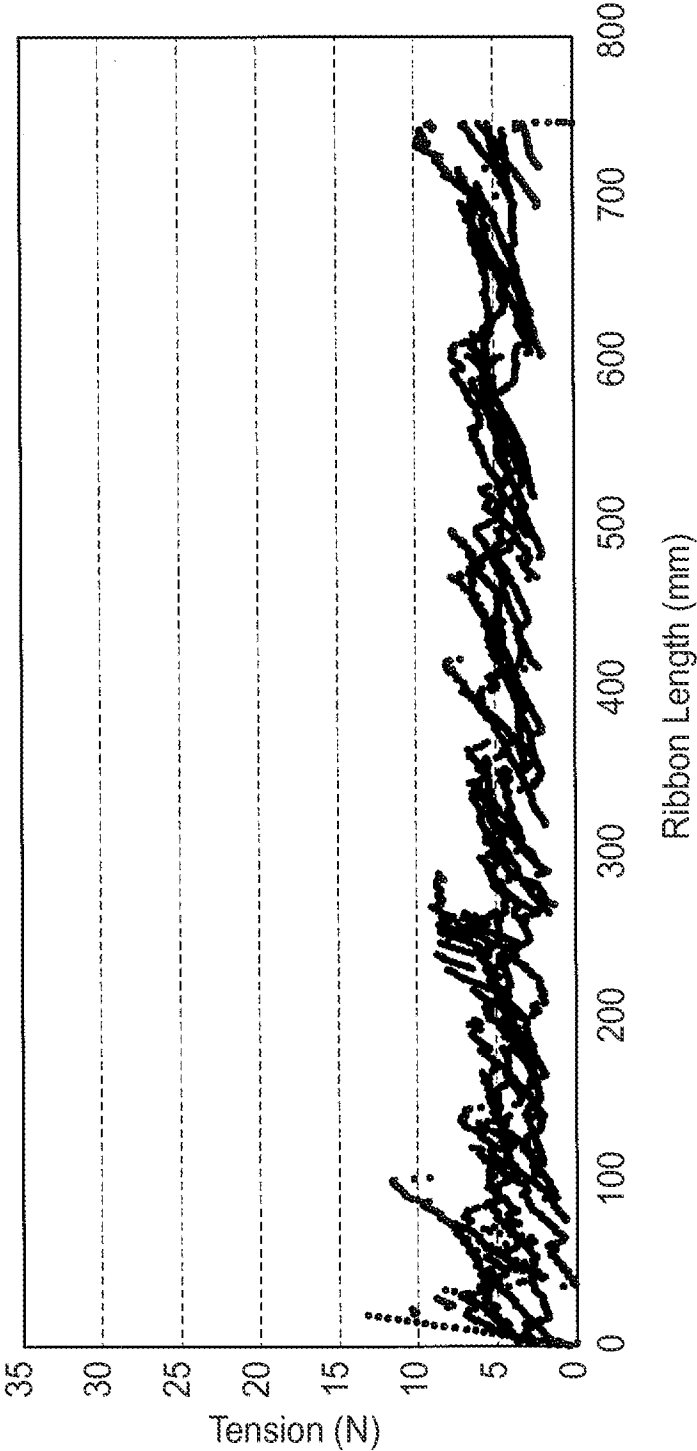


FIG. 5

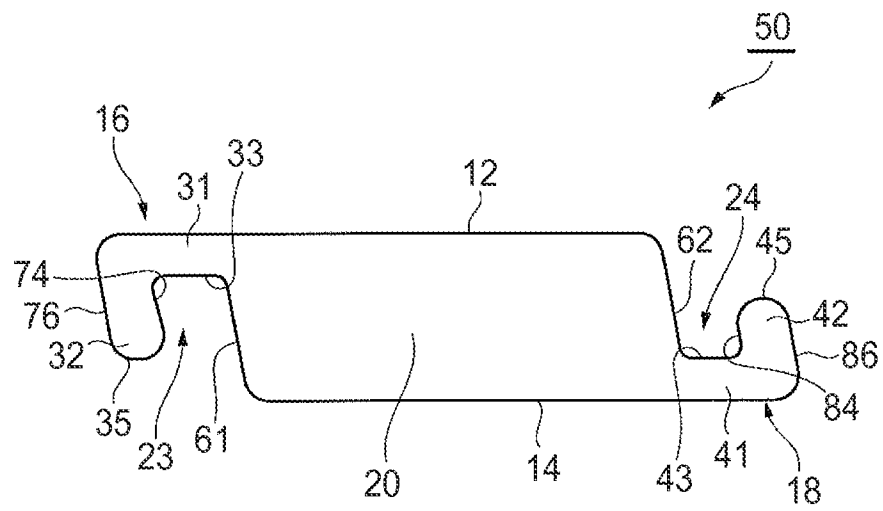


FIG. 6A

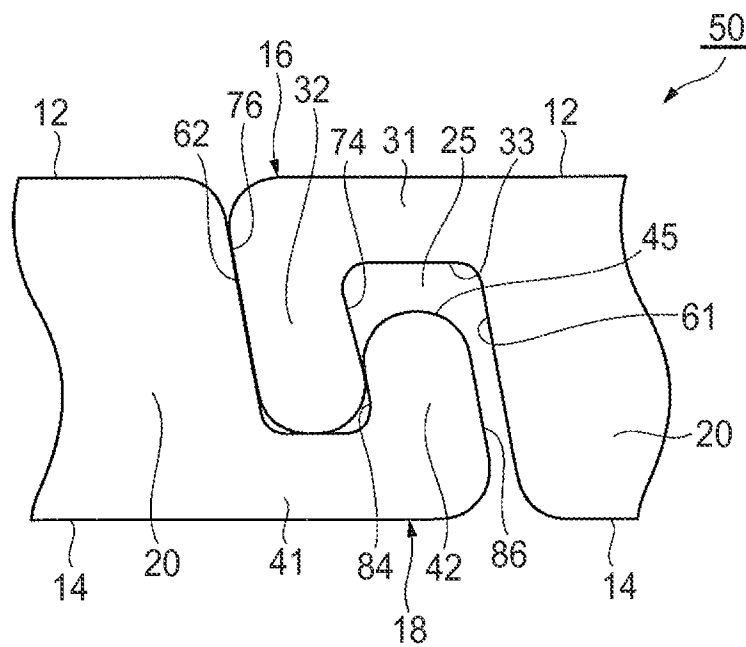
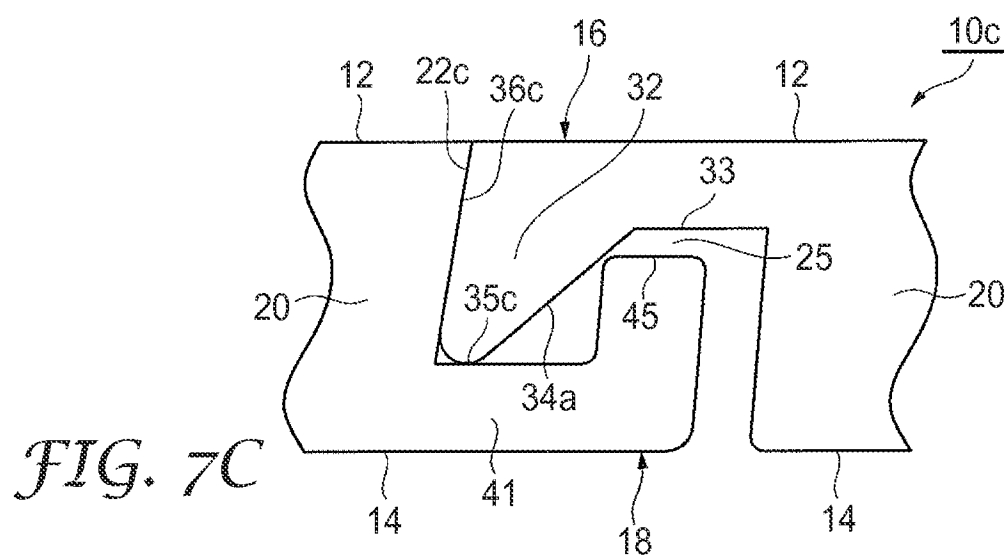
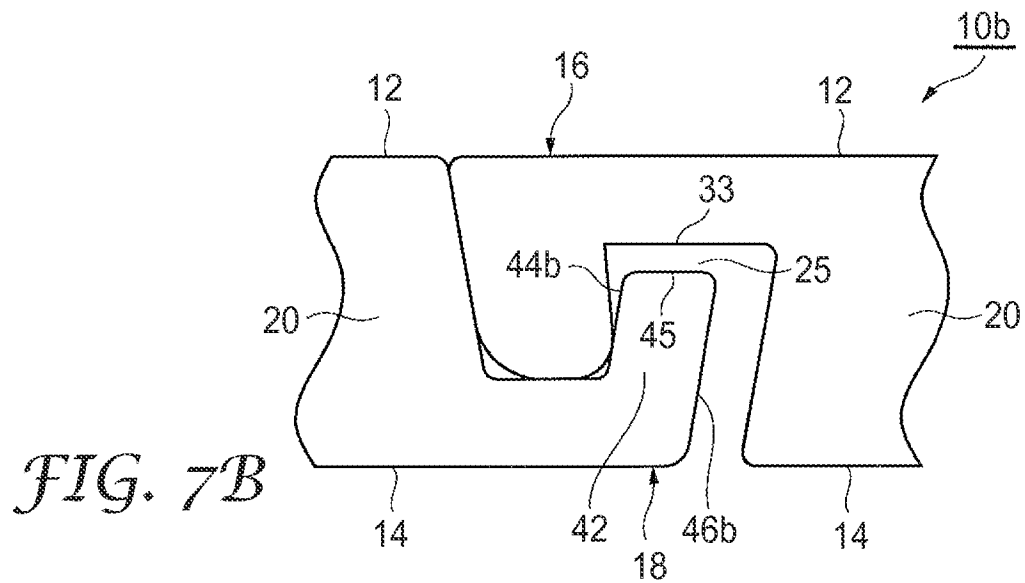
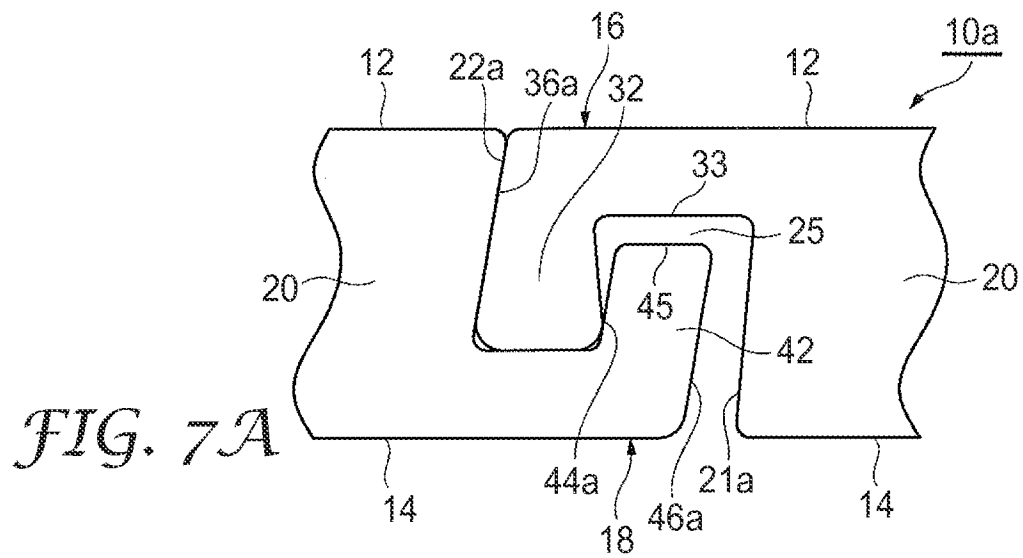


FIG. 6B

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FIG. 8A

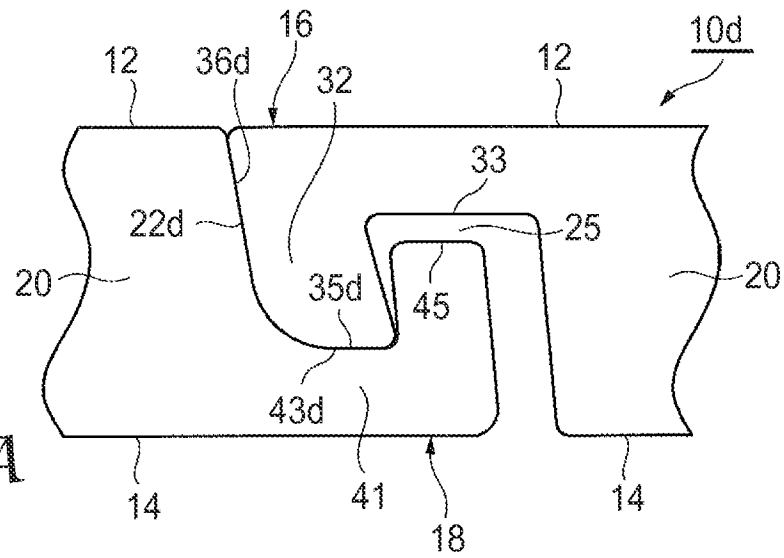


FIG. 8B

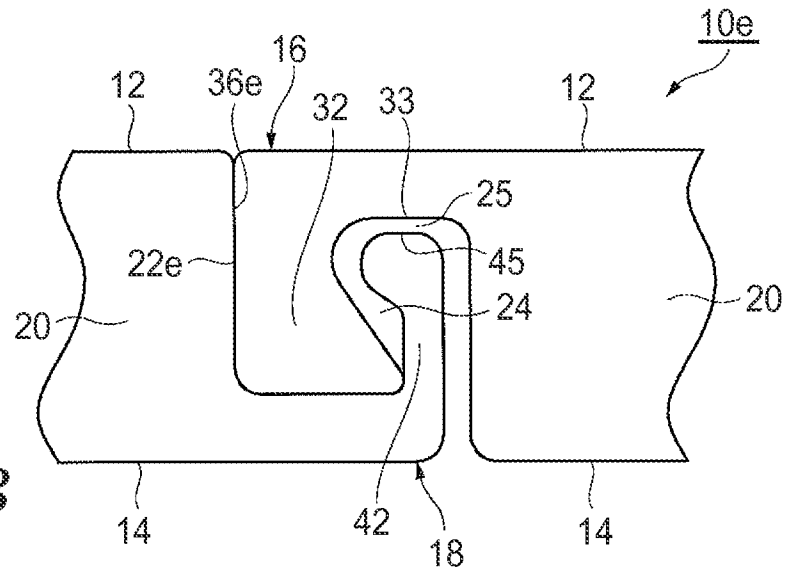
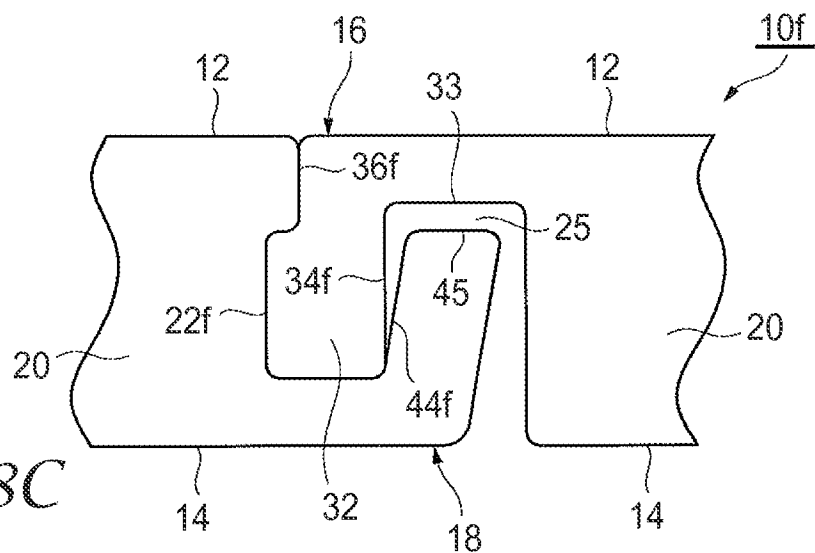


FIG. 8C



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/043154**A. CLASSIFICATION OF SUBJECT MATTER****H02G 15/08(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H02G 15/08; B32B 1/08; B29C 53/58; H02G 15/18; F16L 11/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & Keywords: core ribbon, covering tool, spirally, helically, insulation, terminal, unwinding, cylindrical tube

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 2013-0164475 A1 (NICHOLAS G. RIVARD) 27 June 2013 See abstract, paragraphs [0036]-[0040] and figures 4A-6.	1-8
A	JP 2000-102156 A (FUJIKURA LTD.) 07 April 2000 See paragraphs [0014]-[0021], claims 1-2 and figure 1.	1-8
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A	EP 1860749 A2 (TYCO ELECTRONICS RAYCHEM GMBH) 28 November 2007 See abstract, paragraphs [0031]-[0054] and figures 1-8.	1-8



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

08 October 2014 (08.10.2014)

Date of mailing of the international search report

10 October 2014 (10.10.2014)

Name and mailing address of the ISA/KR

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