STRESS END PORTION STRUCTURE OF PRESTRESSED CONCRETE STRUCTURE BODY AND METHOD OF FORMING THE STRESS END PORTION

A tensioned end of a prestressed-concrete structure is constructed easily and reliably.

A grout can be made of a transparent material, particularly preferably a transparent electrically insulating material, thereby reliably performing grouting while visually observing and checking the filling condition of grout G in the grout can from the outside thereof.

A synthetic resin, particularly an ionomer resin, is preferably used as the transparent electrically insulating material constituting the grout can.
Description

Technical Field of the Invention:

[0001] The present invention relates to the structure of a tensioned end of a prestressed-concrete structure and also relates to a method of constructing the tensioned end. More particularly, the present invention relates to a technique wherein a transparent material is employed for a grout can to surely perform the construction of the tensioned end.

Background Art:

[0002] According to a conventional prestressed-concrete structure producing method (post-tensioning system), prestressing steel and a sheath covering it, together with reinforcing bars, are disposed in a form. Thereafter, concrete is placed in the form. After, the concrete has reached a predetermined strength, the prestressing steel is tensioned from both horizontal ends or either of them, and each end portion of the prestressing steel is anchored with an anchoring device, thereby prestressing the concrete.

[0003] Thereafter, a grout is externally injected into the anchorage and its vicinities and also into the sheath at a high pressure (0.5 to 1 MPa) to fill them for the purpose of preventing corrosion of the tensioned prestressing steel and for securing the prestressing steel in the sheath under tension and further for fixing the interior of the anchorage and its vicinities. At that time, a grout can is secured to the anchorage to cover the whole anchorage in a hermetically sealed state, and thereafter, the grout is injected from an outer communicating hole (grout hose fitting hole) to fill the inside of the grout can.

[0004] Japanese Patent Application Unexamined Publication (KOKAI) No. Hei 8-35331 discloses a method in which a metallic grout can is used. In this case, however, the inside of the grout can cannot be seen. Therefore, it is impossible to confirm the completeness of the filling of grout at the tensioned end portion, which is particularly important. Further, because the grout can is made of a metal, an electric potential difference is produced between the grout can and the prestressing steel or other different kind of metal. Consequently, a corrosive current flows, and this may cause corrosion of the prestressing steel.

[0005] Further, when the grout is injected into the grout can at a high pressure (0.5 to 1 MPa), if the grout can is in the shape of a cylinder with a flat bottom as illustrated in Japanese Patent Application Unexamined Publication (KOKAI) No. Hei 8-35331, the pressure of the injected grout is applied non-uniformly to the inner surfaces of the grout can. This involves the danger that the grout can may be deformed and hence the grout may leak.

[0006] In the case of internal cable construction, the anchorage structure including the grout can and its vicinities is covered with post-placed concrete. If the adhesion between the post-placed concrete and the grout can is incomplete, it is impossible to attain the primary object, i.e. forming the anchorage and the post-placed concrete into one integral structure. In the case of external cable construction, the grout can is relatively large in size. Therefore, the conventional metallic grout can is heavy in weight and hence inconvenient to handle.

Disclosure of Invention:

[0007] As the result of conducting exhaustive studies to solve the above-described problems with the prior art, the present inventors succeeded in establishing a substantially perfect grouting technique and thus came to provide the present invention having the following arrangements.

1) A tensioned end structure of a prestressed-concrete structure wherein a grout can that is installed over an anchorage in such a manner as to cover the whole anchorage is filled with a grout as a cement or non-cement anti-corrosive filler for anti-corrosive protection of a tendon member and an anchoring device, which is characterized in that the grout can is made of a transparent material.
2) A tensioned end structure of a prestressed-concrete structure as stated in the foregoing paragraph (1), which is characterized in that the transparent material constituting the grout can is at least one selected from the group consisting of polyethylenes and derivatives thereof, polypropylenes, polystyrenes, polycarbonates, polymethyl methacrylates, and polyvinyl chlorides.
3) A tensioned end structure of a prestressed-concrete structure as stated in any one of the foregoing paragraphs (1) to (5), which is characterized in that the transparent material constituting the grout can consists essentially of an ionomer resin, wherein the ionomer resin is an α-olefin-α, β-unsaturated carboxylic acid copolymer having carboxyl groups neutralized with metal ions.
4) A tensioned end structure of a prestressed-concrete structure as stated in any one of the foregoing paragraphs (1) to (3), which is characterized in that the grout can is a half-cut hollow spherical member having a ring-shaped rib at the upper edge thereof.
5) A tensioned end structure of a prestressed-concrete structure as stated in any one of the foregoing paragraphs (1) to (3), which is characterized in that the grout can is a cylindrical member, one end of which is closed, the cylindrical member having a ring-shaped rib at the upper edge thereof and a half-cut hollow spherical portion at the bottom thereof.
6) A tensioned end structure of a prestressed-concrete structure as stated in any one of the foregoing paragraphs (1) to (5), which is characterized in that the outer surface of the grout can has been formed...
into an uneven surface so as to be easily adherable to post-placed concrete or mortar.

(7) A tensioned end structure of a prestressed-concrete structure as stated in any one of the foregoing paragraphs (1) to (6), which is characterized in that the grout can is made of an electrically insulating material.

(8) A method of constructing a tensioned end of a prestressed-concrete structure, which is characterized by installing a grout can made of a transparent material over an anchorage to cover the whole anchorage with the grout can, and fully filling the grout can with a grout as a cement or non-cement anti-corrosive filler for anti-corrosive protection of a tendon member and an anchoring device while visually observing the filling condition of the grout in the grout can from the outside.

(9) A method of constructing a tensioned end of a prestressed-concrete structure as stated in the foregoing paragraph (8), which is characterized in that the transparent material constituting the grout can is made of a transparent material selected from the group consisting of polyethylenes and derivatives thereof, polypropylenes, polystyrenes, polycarbonates, polymethyl methacrylates, and polyvinyl chlorides.

(10) A method of constructing a tensioned end of a prestressed-concrete structure as stated in the foregoing paragraph (8), which is characterized in that the transparent material constituting the grout can consists essentially of an ionomer resin, wherein the ionomer resin is an α-olefin-α, β-unsaturated carboxylic acid copolymer having carboxyl groups neutralized with metal ions.

(11) A method of constructing a tensioned end of a prestressed-concrete structure as stated in any one of the foregoing paragraphs (8) to (10), which is characterized in that the grout can is a half-cut hollow spherical member having a ring-shaped rib at the upper edge thereof.

(12) A method of constructing a tensioned end of a prestressed-concrete structure as stated in any one of the foregoing paragraphs (8) to (10), which is characterized in that the grout can is a cylindrical member, one end of which is closed, the cylindrical member having a ring-shaped rib at the upper edge thereof and a half-cut hollow spherical portion at the bottom thereof.

(13) A method of constructing a tensioned end of a prestressed-concrete structure as stated in any one of the foregoing paragraphs (8) to (12), which is characterized in that the outer surface of the grout can has been formed into an uneven surface so as to be easily adherable to post-placed concrete or mortar.

(14) A method of constructing a tensioned end of a prestressed-concrete structure as stated in any one of the foregoing paragraphs (8) to (13), which is characterized in that the grout can is made of an electrically insulating material.

(15) A grout can made of a transparent material as stated in any one of the foregoing paragraphs (1) to (13), which is used in a tensioned end structure of a prestressed-concrete structure or a production thereof.

Brief Description of the Drawings:

[0008]

Fig. 1 is a sectional view of a tensioned end structure of a prestressed-concrete structure of an internal cable system according to Example 1 of the present invention.

Fig. 2 is a sectional view of a tensioned end structure of a prestressed-concrete structure of an external cable system according to Example 2 of the present invention.

Fig. 3 is a sectional view of a tensioned end structure of a prestressed-concrete structure of an external cable system according to Example 3 of the present invention.

Fig. 4 is a plan view and a sectional view of a grout can in Fig. 1.

Fig. 5 is a plan view and a sectional view of a grout can in Fig. 2.

Fig. 6 is a plan view and a sectional view of a grout can in Fig. 3.

Explanation of Reference Signs:

[0009]

1: prestressing steel cable
2: sheath
3: socket of anchoring device
4: plug of anchoring device
5, 5’, 5’’: grout can
5a, 5a’, 5a’’: rib of grout can
5b, 5b’, 5b’’: grout discharge pipe
5c, 5c’: grout discharge pipe
5d: bolt insertion hole
5e: grout injection pipe
6: grout hose
7: packing
8: grout can securing bolt
9: spiral reinforcement
10: differential-diameter joint
10a: grout injection pipe of differential-diameter joint
11: anchor plate
12: anchor head
13: wedge
14: inner trumpet
15: outer trumpet
16: caulking ring
17: resin sheath
Embodiments of the present invention will be described below with reference to the accompanying drawings.

Fig. 1 is a sectional view of a tensioned end structure of a prestressed-concrete structure of an internal cable system according to Example 1 of the present invention. Fig. 2 is a sectional view of a tensioned end structure of a prestressed-concrete structure of an external cable system according to Example 2 of the present invention. Fig. 3 is a sectional view of a tensioned end structure of a prestressed-concrete structure of an external cable system according to Example 3 of the present invention.

Fig. 4 is a plan view and a sectional view of a grout can in Fig. 1. Fig. 5 is a plan view and a sectional view of a grout can in Fig. 2. Fig. 6 is a plan view and a sectional view of a grout can in Fig. 3.

In the drawing: C denotes concrete; G denotes grout; M denotes post-placed concrete or mortar; 1 denotes prestressing steel cables; 2 denotes a sheath; 3 denotes a socket of anchoring device; 4 denotes a plug; 5 denotes a grout injection pipe; 5a denotes ribs of grout cans; 5b, 5c denote grout discharge pipes; 5a', 5b', 5c' denote bolt insertion holes; 5e denotes a grout injection pipe; 6 denotes a grout hose; 7 denotes a packing; 8 denotes grout; 9 denotes spiral reinforcement; 10 denotes a differential-diameter joint; 10a denotes a grout injection pipe of differential-diameter joint; 11 denotes an anchor plate; 12 denotes an anchor head; 13 denotes wedges; 14 denotes an inner trumpet; 15 denotes an outer trumpet; 16 denotes a caulkking ring; 17 denotes a resin sheath; and 18 denotes a steel pipe.

First, as shown in Fig. 1, which is a sectional explanatory view of a tensioned end structure in the vicinity of an anchorage of an internal cable system, end portions of prestressing steel cables 1 are anchored under tension by using a socket 3 and a plug 4, which constitute an anchoring device, buried in an end portion of concrete C. A sheath 2 is connected to a projecting portion 3a of the socket 3 through a differential-diameter joint 10 to enclose a bundle of 6 to 12 prestressing steel cables 1. A grout can 5 is secured over the anchorage of the tensioned end with grout can securing bolts 8.

It should be noted that as the grout can those as shown in Figs. 4 to 6 can be used. The grout can 5 shown in Figs. 4(a) and (b) is a cylindrical member, one end of which is closed. The cylindrical member has a ring-shaped rib 5a at the upper edge thereof. The grout can 5 shown in Figs. 5(a) and (b) is a cylindrical member, one end of which is closed. The cylindrical member has a ring-shaped rib 5a' at the upper edge thereof and a half-cut hollow spherical portion 50 at the bottom thereof. The grout can 5 shown in Figs. 6(a) and (b) is a cylindrical member, one end of which is closed. The cylindrical member has a ring-shaped rib 5a' at the upper edge thereof and a slightly curved bottom portion.

As shown in Figs. 1 and 4, the belly portion of the grout can 5 is provided with connecting openings, and grout discharge pipes 5b and 5c are attached to the connecting openings to fit grout hoses 6 thereto, respectively.

As shown in Fig. 1, grout G is introduced into the sheath 2 at a high pressure (0.5 to 1 MPa) from a grout injection pipe 10a of the differential-diameter joint to fill the grout can 5 through through-holes (not shown) provided in the plug 4 in the anchorage. Excess grout is discharged to the outside through the grout discharge pipes 5b and 5c and the grout hoses 6.

At this time, because the grout can 5 is made of a transparent material, the filling condition of the grout can be visually observed easily from the outside, and it is possible to readily find any void portion left unfilled in the inner wall of the grout can 5. Therefore, if such a void portion is found, additional grouting is carried out to refill it, thereby attaining a completely filled condition.

It should be noted that the grout G is a cement milk mixed with an admixture, e.g. a dispersing agent. Then, concrete or mortar M for post placement is placed and hardened by using a form so as to cover the surface of the concrete C in the vicinity of the anchorage and also cover the outer peripheral surface of the grout can 5.

It is preferable that the post-placed concrete or mortar M should be a material identical or similar to the concrete C so as to be integrated with the latter.

Next, the construction of a tensioned end in the vicinity of an anchorage of an external cable system will be described. As shown in Fig. 2, which is a sectional view of a tensioned end structure in the vicinity of the anchorage, end portions of prestressing steel cables 1 are anchored under tension by using an anchor head 12 attached to the outer surface of an end portion of concrete C, together with wedges 13. An anchor plate 11 is embedded in the inner surface of the concrete C inside the anchor head 12.

Further, an outer trumpet 15, together with an inner trumpet 14 inserted therein, is installed in the vicinity of the anchorage. A steel pipe 18 is fitted into the forward end portion of the outer trumpet 15. The forward end portion of the inner trumpet 14 is fitted into a resin sheath 17. In addition, a caulkking ring 16 is fitted around the outer peripheral surface of the overlap of the inner trumpet 14 and the resin sheath 17.

A bundle of 12 to 27 prestressing steel cables 1 is inserted to extend through the inner trumpet 14 and

Best Mode for Carrying Out the Invention:
the resin sheath 17.

0025 It should be noted that a grout can 5′ is secured to the surface of the anchor plate 11 with grout can securing bolts 8.

0026 The grout can 5′ used in this case is, as shown in Fig. 5, a cylindrical member, one end of which is closed. The cylindrical member has a ring-shaped rib 5a at the upper edge thereof and a half-cut hollow spherical portion 50 at the bottom thereof. Because it has the cylindrical portion 51, the grout can 5′ is correspondingly increased in height.

0027 The belly portion of the grout can 5′ is provided with connecting openings, and grout discharge pipes 5b and 5c are attached to the connecting openings to fit grout hoses 6 thereto, respectively.

0028 As shown in Fig. 2, which is a sectional view of the anchorage and its vicinities, grout G is introduced into the grout can 5′ at a high pressure (0.5 to 1 MPa) from the right-hand side through the sheath 17 to fill the grout can 5′.

0029 The grout G is filled into the grout can 5′ through through-holes (not shown) provided in the anchor head 12. Excess grout is discharged to the outside through the grout discharge pipes 5b′ and 5c′ and the grout hoses 6.

0030 At this time, because the grout can 5′ is made of a transparent material, the filling condition of the grout can be visually observed easily from the outside, and it is possible to readily find any void portion V left unfilled in the inner wall of the grout can 5′. Therefore, if such a void portion is found, additional grouting is carried out to refill it, thereby attaining a completely filled condition.

0031 The term “transparent material for the grout can” as used in the present invention means a material that allows the filling condition of grout G in the grout can and the presence of air bubbles, etc. to be visually checked from the outside of the grout can. It is possible to use any material that is transparent and mechanically strong to some extent, for example, synthetic resins, high-strength glass (including tempered glass coated with a transparent resin), and ceramics.

0032 Particularly, a transparent synthetic resin material is preferably used. Because the material is required to exhibit pressure resistance (during grouting), impact resistance, and moderate flexibility and toughness (when the rib portion is bolted), it is particularly preferable to use an ionomer resin consisting essentially of an α-olefin-α, β-unsaturated carboxylic acid copolymer having carboxyl groups neutralized with metal ions, which is a polyethylene derivative.

0033 The polyethylene derivative-base ionomer resin is prepared by copolymerization of ethylene with a small amount of (meth)acrylic acid metal salt, and also known as an ethylene-base ionomer (EBI). The ionomer resin is excellent in transparency and also excellent in pressure resistance, flexibility and toughness.

0034 The above-described transparent materials are generally not electrically conductive (i.e. they are electrically insulative) and hence unlikely to cause a corrosive electric current. It should be noted that polyethylenes (or polyethylene derivative-base ionomer resins) are also preferable from the viewpoint that they are free from leakage of harmful substances (e.g. environmental hormones) into the environment.

0035 Further, in the present invention, the grout can is transparent and hence allows any portion left unfilled with grout to be visually recognized easily from the outside of the grout can. Therefore, if an unfilled portion is found after the grout has hardened, the grout can is bored to provide injection and discharge openings to regroup the unfilled portion, thereby enabling the grout to be completely filled in the grout can (easiness and reliability of filling condition inspection and repairing).

Examples:

0036 The present invention will be described below more specifically by way of examples.

Example 1:

0037 This is an example of an internal cable system as shown in Fig. 1.

0038 Molding of the grout can 5 was carried out by injection molding of a transparent resin using a mold having an inner surface processed into an embossing negative mold configuration in advance.

0039 As a transparent electrically insulating resin material, “Himilan 1706” (trade name), which is a polyethylene derivative-base ionomer resin available from DuPont-Mitsui Polychemicals Co., Ltd., was used.

0040 The grout can 5 has a configuration as shown in Fig. 4. That is, the grout can 5 is a half-cut hollow spherical member having a ring-shaped rib 5a at the upper edge thereof. The inner diameter of the upper edge is 122 mm. The height of the grout can 5 is 60 mm. The rib width is 17 mm. Grout discharge pipes 5b and 5c (outer diameter: 19 mm) for fitting grout hoses are attached to the grout can 5, and grout hoses 6 are connected thereto.

0041 First, as shown in Fig. 1, grout G, which is a cement milk mixed with an admixture, e.g. a dispersing agent, is introduced into the grout can 5 from the grout injection pipe 10a via the anchorage.

0042 The thickness of the grout can 5 is 4 mm. The pressure resistance of the grout can 5 satisfies the required waterproof pressure of 1 MPa. Even when grout was introduced into the grout can 5 at a high pressure (0.5 to 1 MPa), neither deformation of the grout can 5 nor leakage of grout was observed.

0043 The filling condition of the grout G was visually observable from the outside through the grout can 5. Thus, it was possible to easily confirm that neither air bubbles nor voids were present. It should be noted that the surface of the grout can 5 had been formed into an uneven surface (not shown) by embossing. Accordingly,
the adhesion of the grout can 5 to post-placed concrete
M was good (it was confirmed by a test of embedding
the grout can into concrete, which was carried out sepa-
rately, that the grout can did not separate from concrete
after it had hardened).

Example 2:

[0044] This is an example of an external cable system
as shown in Fig. 2. The grout can 5' was produced by
injection molding using a material similar to that in Ex-
ample 1.
[0045] The grout can 5' has a configuration as shown
in Figs. 5(a) and (b). That is, the grout can 5' is a cylin-
drical member, one end of which is closed. The cylindri-
cal member has a ring-shaped rib 5a' at the upper edge
thereof and a half-cut hollow spherical portion 50 at the
bottom thereof. The grout can 5' is provided with grout
hose fitting pipes (outer diameter: 19 mm) 5b' and 5c',
and grout hoses 6 are connected thereto.
[0046] The cylindrical inner diameter of the upper
edge of the grout can 5' is 227 mm. The height of the
gROUT can 5' is 204 mm. The rib width is 21.5 mm.
[0047] As shown in Fig. 2, which is a sectional view
of the anchorage and its vicinities, grout G is introduced
into the grout can 5' at a high pressure (0.5 to 1 MPa)
from the right-hand side through the sheath 17 to fill the
gROUT can 5'.
[0048] The grout G is filled into the grout can 5'
through through-holes (not shown) provided in the an-
chor head 12. Excess grout is discharged to the outside
through the grout discharge pipes 5b' and 5c' and the
gROUT hoses 6.
[0049] It was visually observed from the outside dur-
ing filling the grout that a void portion V remained in the
inner wall surface of the grout can 5'. Therefore, the
grouting was continued. Consequently, the void portion
V became invisible. Thus, it was perceived that the grout
G had been completely filled.
[0050] It should be noted that the grout G used in this
example was also a cement milk similar to that in Ex-
ample 1.
[0051] The thickness of the grout can 5' is 4 mm. The
pressure resistance of the grout can 5' satisfies the re-
quired waterproof pressure of 1 MPa. Even when grout
was introduced into the grout can 5' at a high pressure
(0.5 to 1 MPa), neither deformation of the grout can 5'
or leakage of grOUT was observed.
[0052] Further, the resin grout can 5' used in this ex-
ample was light in weight in comparison to the conven-
tional metallic grout can and hence easy to handle.
Moreover, because the grout can 5' was not electrically
conductive, there is no fear of the prestressing steel be-
ing corroded by a corrosive electric current that would
otherwise be generated.

Example 3:

[0053] This is an example of an external cable system
as shown in Fig. 3. The grout can 5" was produced by
injection molding using a material similar to that in Ex-
ample 1.
[0054] As shown in Figs. 6(a) and (b), the grout can
5" is a cylindrical member, one end of which is closed.
The cylindrical member has a ring-shaped rib 5a" at the
upper edge thereof and a slightly curved bottom portion.
The grout can 5" is provided with grout hose fitting pipes
(outter diameter: 19 mm) 5b" and 5e, and grout hoses 6
are connected thereto. The pipe 5b" is for grout dis-
charge. The pipe 5e is for grout injection.
[0055] The cylindrical inner diameter of the upper
edge of the grout can 5" is 108 mm. The height of the
gROUT can 5" is 150 mm. The rib width is 24 mm. The
gROUT can 5" was made of an acrylic resin.
[0056] As shown in Fig. 3, grout G is introduced into
the grout can 5" through the grout injection pipe 5e to
fill the grout can 5". At this time, additional grouting is
carried out satisfactorily so that no void portion will be
left inside the grout can 5". Excess grout is discharged
to the outside through the grOUT discharge pipe 5b".
[0057] It should be noted that if there is some fear of
the presence of a void continuously extending to the in-
side of the structure along the tendon member, a hole
is bored in the grout can, and a fiberscope or the like is
inserted into the grout can through the hole, thereby al-
lowing investigation of the void.

Industrial Applicability:

[0058] As has been stated above, according to the
present invention, the grout can is made of a transparent
material. Therefore, during the construction of a ten-
sioned end of a prestressed-concrete structure, the fill-
ing condition of grout in the grout can can be visually
observed easily from the outside and grasped reliably.
[0059] If the material constituting the grout can is a
transparent and electrically insulating material, no elec-
tric potential difference is produced between the grout
can and the prestressing steel or other different kind of
metal, which would otherwise occur due to water
present in a void or the like that is not visually observa-
ble. Consequently, there is no danger of the prestres-
sing steel being corroded by a corrosive electric current
as in the prior art.
[0060] Further, the grout can is formed in the shape
of a half-cut hollow spherical member or a cylindrical
member, one end of which is closed, and which has a
half-cut hollow spherical portion at the bottom thereof,
whereby it is possible to prevent deformation of the grout
can and leakage of grout during grouting at high pres-
sure. In the case of internal cable construction, if the
outer surface of the grout can is processed into an un-
even surface in advance, the adhesion of the grout can
to post-placed concrete becomes good.
Further, in the case of using a grout can made of a transparent resin, even if it is relatively large in size, the grout can is easy to handle because it is light in weight.

It should be noted that it was possible to fill the grout completely in the examples using transparent grout cans. However, even if a void is present in the grout can for some reason after the grout has hardened in an external cable system, the void can be visually recognized easily from the outside of the grout can. Therefore, repair can be executed by boring grout injection and discharge openings in the grout can and refilling the grout into the void.

Claims

1. A tensioned end structure of a prestressed-concrete structure in which a grout can that is installed over an anchorage in such a manner as to cover the whole anchorage is filled with a grout as a cement or non-cement anti-corrosive filler for anti-corrosive protection of a tendon member and an anchoring device, wherein the grout can is made of a transparent material.

2. A tensioned end structure of a prestressed-concrete structure according to claim 1, wherein the transparent material constituting the grout can is at least one selected from the group consisting of polyethylenes and derivatives thereof, polypropylenes, polystyrenes, polycarbonates, polymethyl methacrylates, and polyvinyl chlorides.

3. A tensioned end structure of a prestressed-concrete structure according to claim 1 or 2, wherein the transparent material constituting the grout can consists essentially of an ionomer resin, wherein the ionomer resin is an \( \alpha \)-olefin-\( \alpha \), \( \beta \)-unsaturated carboxylic acid copolymer having carboxyl groups neutralized with metal ions.

4. A tensioned end structure of a prestressed-concrete structure according to any one of claims 1 to 3, wherein the grout can is a half-cut hollow spherical member having a ring-shaped rib at an upper edge thereof.

5. A tensioned end structure of a prestressed-concrete structure according to any one of claims 1 to 3, wherein the grout can is a cylindrical member, one end of which is closed, the cylindrical member having a ring-shaped rib at an upper edge thereof and a half-cut hollow spherical portion at a bottom thereof.

6. A tensioned end structure of a prestressed-concrete structure according to any one of claims 1 to 5, wherein an outer surface of the grout can has been formed into an uneven surface so as to be easily adherable to post-placed concrete or mortar.

7. A tensioned end structure of a prestressed-concrete structure according to any one of claims 1 to 6, wherein the grout can is made of an electrically insulating material.

8. A method of constructing a tensioned end of a prestressed-concrete structure, comprising the steps of:

- installing a grout can made of a transparent material over an anchorage to cover the whole anchorage with the grout can; and
- fully filling the grout can with a grout as a cement or non-cement anti-corrosive filler for anti-corrosive protection of a tendon member and an anchoring device while visually observing a filling condition of the grout in the grout can from outside.

9. A method of constructing a tensioned end of a prestressed-concrete structure according to claim 8, wherein the transparent material constituting the grout can is at least one selected from the group consisting of polyethylenes and derivatives thereof, polypropylenes, polystyrenes, polycarbonates, polymethyl methacrylates, and polyvinyl chlorides.

10. A method of constructing a tensioned end of a prestressed-concrete structure according to claim 8, wherein the transparent material constituting the grout can consists essentially of an ionomer resin, wherein the ionomer resin is an \( \alpha \)-olefin-\( \alpha \), \( \beta \)-unsaturated carboxylic acid copolymer having carboxyl groups neutralized with metal ions.

11. A method of constructing a tensioned end of a prestressed-concrete structure according to any one of claims 8 to 10, wherein the grout can is a half-cut hollow spherical member having a ring-shaped rib at an upper edge thereof.

12. A method of constructing a tensioned end of a prestressed-concrete structure according to any one of claims 8 to 10, wherein the grout can is a cylindrical member, one end of which is closed, the cylindrical member having a ring-shaped rib at an upper edge thereof and a half-cut hollow spherical portion at a bottom thereof.

13. A method of constructing a tensioned end of a prestressed-concrete structure according to any one of claims 8 to 12, wherein an outer surface of the grout can has been formed into an uneven surface so as
to be easily adherable to post-placed concrete or mortar.

14. A method of constructing a tensioned end of a pre-stressed-concrete structure according to any one of claims 8 to 13, wherein the grout can is made of an electrically insulating material.

15. A grout can made of a transparent material as claimed in any one of claims 1, to 13, which is used in a tensioned end structure of a prestressed-concrete structure or a production thereof.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
   Int.Cl1 E04G21/12, E01D1/00

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)
   Int.Cl1 E04G21/12, E01D1/00

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

Electronic database consulted during the international search (name of database and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<tbody>
<tr>
<td>X</td>
<td>JP 3-3005 B2 (Sho-Bond Corp.), 17 January, 1991 (17.01.91), (Family: none)</td>
<td>1-5, 7-12, 14, 15</td>
</tr>
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<td>Y</td>
<td>Full text; Figs. 1 to 7 (Family: none)</td>
<td>6, 13</td>
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<td>Y</td>
<td>JP 2001-323600 A (Sumitomo Electric Industries, Ltd.), 22 November, 2001 (22.11.01), Par. No. [0031]; Fig. 2 (Family: none)</td>
<td>6, 13</td>
</tr>
</tbody>
</table>

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of the actual completion of the international search
26 August, 2003 (26.08.03)

Date of mailing of the international search report
09 September, 2003 (09.09.03)

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