

LOCATING DEVICE FOR LOCATING A REINFORCING BAR JOINT SLEEVE

Field of the Invention

5 The present invention relates to a locating device for locating a reinforcing bar joint sleeve to be disposed in the interior of precast concrete relative to a molding form in fabricating a precast concrete component (hereinafter referred to simply as a "PC component") with use of the molding form.

10 Background of the Invention

FIGS. 8 and 9 illustrate a PC component fabricating method using a conventional reinforcing bar joint sleeve locating device. More particularly, FIG. 8 shows a state in which a reinforcing bar 29 and a reinforcing bar joint sleeve 1 are secured to a molding
15 form 20 disposed on a board B on which concrete is placed, and FIG. 9 shows a formed PC component A after removal from the molding form. In FIG. 9, a rightwards projecting portion 29a of the reinforcing bar 29 is for insertion into another PC component, and the reinforcing bar joint sleeve 1 is for fitting with another PC component.

20 FIGS. 10 and 11 illustrate an example of a conventional reinforcing bar joint sleeve locating device (see also, for example, Japanese Published Examined Utility Model Publication No. Hei 7-34109 - in particular, Figure 1 thereof and the corresponding part of the description). In FIG. 10, there is disposed a support member 26 formed of an elastic material and with a cylindrical portion 24 thereof inserted into an opening of the
25 reinforcing bar joint sleeve 1 whose opening faces towards a molding form 20. A rod member 25 having an anti-dislodgment portion 18 extends through both the support member 26 and molding form 20. A cam 30 for pulling the rod member 25 outwards of the molding form 20 is pivotally connected with pin 25a to the rod member 25 at a position outside the molding form 20.

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FIG. 11 shows a state in which the reinforcing bar joint sleeve 1 has been pulled

outwardly of the molding form 20 by rotating the cam 30. The support member 26 is compressed as the rod member 25 moves leftwards in the figure. Particularly, as a result of the compression, the cylindrical portion 24 expands radially outwards and comes into contact with a projecting/recessed portion formed on an inner surface of the reinforcing bar joint sleeve 1 to fix the position of the sleeve 1. Thus, in accordance with an eccentric stroke of the cam 30 the reinforcing bar joint sleeve 1 is moved towards an outside of the molding form 20 and is fixed at a predetermined position.

According to this construction, rough axial and radial positions of the reinforcing bar joint sleeve 1 are determined, but since the support member 26 is formed of rubber as an elastic material, an eccentric stroke of the cam 30 and the amount of axial movement of the reinforcing bar joint sleeve 1 may not coincide with each other. Further, the amount of radial expansion may not coincide, thus resulting in the placement of the reinforcing bar joint sleeve 1 being inaccurate.

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Thus, the above construction is not suitable for strict determination of both axial and radial positions. Moreover, particularly the cylindrical portion 24 of the support member 26 may not withstand repeated use because of a large compressive strain thereof for radial expansion.

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The present invention has been proposed in view of the above-mentioned problems of previously proposed devices. Preferred embodiments of the invention seek to provide a reinforcing bar joint sleeve locating device which permits both axial and radial positioning of a reinforcing bar joint sleeve to be established positively, and which device is employable repeatedly.

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In accordance with one aspect of the present invention there is provided a locating device for locating a reinforcing bar joint sleeve, to be disposed in the interior of precast concrete, relative to a molding form in fabricating a precast concrete component with use of the molding form, the locating device comprising a cylindrical ring member disposed in the interior of the reinforcing bar joint sleeve, a plurality of slide pins fitted in an outer

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wall of the ring member so as to be slidable radially outwardly, an elastic ring for urging the plurality of slide pins radially inwardly, a shaft formed by an integral combination of a head portion and a rod portion concentric with the head portion, the head portion being received in the interior of the ring member and having a conical shape which is larger in diameter toward the inside of the reinforcing bar joint sleeve, an insertion hole formed in the molding form for insertion therethrough of the rod portion of the shaft, a threaded member adapted for threaded engagement with a thread formed in the rod portion of the shaft to tighten the reinforcing bar joint sleeve relative to the molding form, and bearing portions formed at radially inner ends of the slide pins for bearing against a tapered surface of the conical head portion of the shaft so that the slide pins are movable radially outwardly in conformity with the tapered surface of the conical head portion in response to movement of the shaft relative to the ring member.

Preferably, the bearing portions formed at the radially inner ends of the slide pins are tapered surfaces conforming to the tapered surface of the head portion of the shaft.

Preferably, the conical head portion of the shaft has a taper angle of between 15 and 45 degrees. In one particular example, it is more preferable to set the taper angle of the head portion at between 35 and 40 degrees.

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Brief Description of the Drawings

A preferred embodiment of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

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FIG. 1 is a sectional side view of a reinforcing bar joint sleeve locating device according to an embodiment of the present invention, in which the upper half represents a state before locating the sleeve and the lower half represents a state after locating the sleeve;

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FIG. 2 illustrates a portion of FIG. 1, in which, like FIG. 1, the upper half represents a state before locating the sleeve and the lower half represents a state after locating the sleeve;

5 FIG. 3 is a side view of a slide pin;

FIG. 4 is a sectional view of the slide pin shown in FIG. 3, taken along line Y-Y;

FIG. 5 is a side view of a ring member;

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FIG. 6 is a sectional view of the ring member shown in FIG. 5, taken along line X-X;

FIG. 7 is a rear view of the ring member shown in FIGS. 5 and 6;

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FIG. 8 illustrates a method for fabricating a PC component using a conventional reinforcing bar joint sleeve locating device;

FIG. 9 illustrates a formed PC component after removal from a molding form;

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FIG. 10 illustrates a state before locating a reinforcing bar joint sleeve with use of a conventional reinforcing bar joint sleeve locating device; and

FIG. 11 illustrates a state after locating the sleeve using the device shown in FIG.

25 10.

Detailed Description

Detailed construction of an embodiment of the present invention are illustrated in
30 FIGS. 1 to 7.

In FIGS. 1 and 2, a state before clamping and fixing of a reinforcing bar joint sleeve and a state after clamping and fixing of the reinforcing bar joint sleeve are shown in an upper portion and a lower portion, respectively, with respect to a center line of each figure. A previously proposed reinforcing bar joint sleeve 1 is disposed near a molding
5 form 20 which is for fabricating a PC structure such as a precast concrete plate, and a cylindrical ring member 2 is disposed inside the reinforcing bar joint sleeve 1. A packing 5 is sandwiched between the reinforcing bar joint sleeve 1 and the molding form 20.

A conical head portion 8, which is larger in diameter axially inwards of the
10 reinforcing bar joint sleeve 1 (rightwards in the figure), is received within an inner hole 2b of the ring member 2.

A rod portion 7 having a screw thread is integral and concentric with an end of the
15 conical head portion 8 to constitute a shaft A8.

The rod portion 7 extends through an insertion hole 20a which is formed in the
molding form 20 concentrically with the reinforcing bar joint sleeve 1, and a butterfly nut
6 as a threaded member is threadedly engaged with the screw thread to abut against an
outer side of the molding form 20. The threaded member is not limited to the butterfly nut
20 6, and may be, for example, an ordinary type of nut. An angular portion 9 for preventing
unwanted rotation of the shaft A8 is formed at an end of the rod portion 7.

A tapered surface 8a of the head portion 8 has a taper angle θ of preferably between
15° and 45°, and more preferably between 35° and 40°. The tapered surface 8a may be a
25 surface which forms a cone or may be a plane formed on a conical surface.

Plural slide pins 3 end portions of which conform to the tapered surface 8a are
fitted in a cylindrical side face of the ring member 2 so as to be movable radially inwardly
and outwardly. Retaining pins P are provided on the molding form 20 side (on the left side
30 in the figure) of the slide pins 3 to lock the tapered surface 8a and hence prevent unwanted

dislodgment of the shaft A8 from the ring member. However, the pins P are not always needed.

FIGS. 3 and 4 illustrate each slide pin 3, in which a tapered bearing surface 3a conforming to the tapered surface 8a of the head portion 8 of the shaft A8 is formed at a radially inner end 3e of the slide pin, and a groove 3d is formed at a radially outer end 3t of the slide pin.

An elastic ring 4 to be described later comes into close contact with a bottom 3f of the groove 3d. It is preferable that the radius of a corner 3b of the upper end 3t be equal to the radius of a round recessed portion 1b formed in an inner surface of the reinforcing bar joint sleeve 1.

The tapered bearing surface 3a as a bearing portion of each slide pin 3 which conforms to the tapered surface 8a of the head portion 8 of the shaft A8 may be such a spherical surface 3f as indicated with a dotted line in FIGS. 3 and 4 or may be any other surface which is slidable in conformity with the tapered surface.

FIGS. 5 to 7 are detail views of the ring member 2.

The ring member 2 is formed in a cylindrical shape having an inside diameter 2b which is defined by both side wall surface 2e and outer wall 2a, the side wall surface 2e having a relatively small hole 2f for preventing the passage of the conical head 8 of the shaft A8 through the ring member. As shown in Figure 6, three pin holes 2c are formed isometrically in the outer wall 2a. The pin holes 2c are formed of a size which permits the slide pins 3 to slide. However, the small hole 2f may be substituted by a bottom without formation thereof.

A groove 2d is formed throughout the circumference of the ring member 2 so as to pass through the center of each pin hole 2c and it has a width equal to the width of the groove 3d of each slide pin 3.

The elastic ring 4 made of rubber is fitted in the grooves 3d of the slide pins 3, and with a clamping force thereof, the slide pins 3 are urged into the ring member 2.

5 A description will be given below of the operation of the reinforcing bar joint sleeve locating device constructed as above.

Referring to FIGS. 1 and 2, the head portion 8 of the shaft A8 is inserted into the inner hole 2b of the ring member 2 in the reinforcing bar joint sleeve 1 and the slide pins 3 are inserted into the inner hole 2b from radially outward positions with respect to the ring member 2. At this time, the tapered surfaces 3a as bearing portions of the slide pins 3 are checked and conformed to the tapered surface 8a of the head portion 8 of the shaft A8.

Then, the elastic ring 4 is fitted in the grooves 3d of the slide pins 3 and is also fitted in the groove 2d of the ring member 2, causing the slide pins 3 to be urged into the ring member 2.

At this stage of the ring member 2, shaft A8 and slide pins 3 having been constituted in one assembly with one another, the rod portion 7 is inserted through the insertion hole 20a of the molding form 20 through the packing 5 and the butterfly nut 6 is brought into threaded engagement with the rod portion on the other side of the molding form 20. The steps so far described constitute an assembling stage, which corresponds to the state of the upper portions with respect to the center lines in FIGS. 1 and 2.

25 Next, there is performed a tightening operation for tightening the reinforcing bar joint sleeve 1 relative to the molding form 20.

The butterfly nut 6 is turned, causing the shaft A8 to be pulled and moved in the direction opposite to the reinforcing bar joint sleeve 1, i.e., leftwards in the figures. At this time, the angular portion, i.e., hexagonal portion, for preventing unwanted rotation of the shaft A8 is clamped to prevent co-rotation of the shaft A8 with the butterfly nut 6.

With the movement of the shaft A8, the head portion 8 and the tapered surface 8a also move and the slide pins 3 slide radially outwards. The amount of this radially outward movement of the slide pins 3 is determined by the number of turns of the butterfly nut 6,
5 that is, by the amount of movement of the shaft A8 relative to the ring member 2.

Then, the corners 3b at the radially outer ends of the slide pins 3 in FIG. 3 come into contact with the round portion 1b formed on the inner surface of the reinforcing bar joint sleeve 1.
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As the amount of the radially outward movement of the slide pins 3 increases, the radially outer ends 3t of the slide pins 3 come into contact with a recessed portion 1a formed on the inner surface of the reinforcing bar joint sleeve 1. Since the three slide pins 3 are equal in the amount of radial movement, the shaft A8 and the reinforcing bar joint
15 sleeve are surely aligned with each other. In this stage, abutment of the slide pins 3 against the recessed portion 1a can be clearly judged from a rotational resistance of the butterfly nut 6.

If the butterfly nut 6 is further rotated, the corner portions 3b of the slide pins 3
20 push the round portion 1b of the reinforcing bar joint sleeve 1 leftwards (relative to FIG. 1) and move the sleeve 1 up to a predetermined position where the sleeve is put in close relationship with the molding form 20.

In this way, both axis accuracy and movement position of the reinforcing bar joint
25 sleeve 1 can be determined accurately. The steps described above constitute a locating stage, which corresponds to the state of the lower portions with respect to the center lines in FIGS. 1 and 2.

Next, for removing the locating device from the molding form 20, the butterfly nut
30 6 is turned in a reverse direction to let the shaft A8 move inwards with respect to the reinforcing bar joint sleeve 1. With the rightward movement of the shaft A8 (relative to

FIG. 1), the head portion 8 and the tapered surface 8a also move. Under the clamping force of the elastic ring 4, the slide pins 3 slide radially inwardly along the tapered surface 8a.

- 5 In this way, a return is made to the assembling stage and the device, including the shaft A8, may be removed, and can be re-used.

Functions and effects of the above-described embodiment of the present invention are as follows:

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- (a) In the reinforcing bar joint sleeve fixing device according to the above-described embodiment of present invention, all of the ring member, shaft and slide pins are solid members substantially free of elasticity, so that both axis position and axial position of the reinforcing bar joint sleeve can be ensured accurately.

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- (b) Since all of the members used are solid members, operation of the device is accurate and precise. For example, positive abutment of the slide pins against the reinforcing bar joint sleeve is clear and hence it is easy to effect location of the sleeve.

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- (c) Since an elastic member such as is used in the conventional device is not used in the present device, the device according to the present invention is re-employable without damage to any components thereof.

25 Explanation of Reference Numerals

1 ... reinforcing bar joint sleeve

2 ... ring member

2a ... outer wall

30 3 ... slide pin

3a ... bearing portion

- 4 ... elastic ring
- 5 ... packing
- 6 ... threaded member (butterfly nut)
- 7 ... rod portion
- 5 8 ... head portion
- A8 ... shaft
- 20 ... molding form
- 20a ... insertion hole

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A locating device for locating a reinforcing bar joint sleeve, to be disposed in the interior of precast concrete, relative to a molding form in fabricating a precast concrete
5 component with use of the molding form, the locating device comprising a cylindrical ring member disposed in the interior of the reinforcing bar joint sleeve, a plurality of slide pins fitted in an outer wall of the ring member so as to be slidable radially outwardly, an elastic ring for urging the plurality of slide pins radially inwardly, a shaft formed by an integral combination of a head portion and a rod portion concentric with the head portion, the head
10 portion being received in the interior of the ring member and having a conical shape which is larger in diameter toward the inside of the reinforcing bar joint sleeve, an insertion hole formed in the molding form for insertion therethrough of the rod portion of the shaft, a threaded member adapted for threaded engagement with a thread formed in the rod portion of the shaft to tighten the reinforcing bar joint sleeve relative to the molding form, and
15 bearing portions formed at radially inner ends of the slide pins for bearing against a tapered surface of the conical head portion of the shaft so that the slide pins are movable radially outwardly in conformity with the tapered surface of the conical head portion in response to movement of the shaft relative to the ring member.
- 20 2. A reinforcing bar joint sleeve locating device as claimed in claim 1, wherein the bearing portions formed at the radially inner ends of the slide pins are tapered surfaces conforming to the tapered surface of the head portion of the shaft.
3. A reinforcing bar joint sleeve locating device as claimed in claim 1 or claim 2,
25 wherein the conical head portion of the shaft has a taper angle of between 15 and 45 degrees.