TITLE OF INVENTION

Method of working connection end of deformed bar for reinforcing concrete~~, deformed bar worked by the method and structure of connecting deformed bar~~.

Description

BACKGROUND OF THE INVENTION

1. Field of The Invention

The present invention relates to a method of working a thread at a connection end of deformed bar for reinforcing concrete for forming a framework of a construction object at sites of construction and civil engineering works, deformed bar worked by the method and a connection structure of deformed bar.

2. Description of the Prior Art

Generally, at sites of construction and civil engineering works, after building a basic framework by using deformed bar for reinforcing concrete, in a procedure of applying and curing concrete, a construction object is erected. In this case, deformed bar refers to bar having projections on the surface, projection in the axial direction refers to "rib" and projection other than in the axial direction refers to "node".

Further, deformed bar for reinforcing concrete mentioned above is supplied by being cut in a predetermined length and accordingly, depending on a size of a construction object, deformed bar for reinforcing concrete is used by being cut or by being cut to a necessary length by mutually connecting pieces thereof.

Further, in mutually connecting pieces thereof, there is used a latching process in which connection end portions of respective pieces of deformed bar are made to overlap, thereafter, bound by steel wires.

However, loss of material is enormous since connection end portions of the respective pieces of deformed bar are used to overlap, pieces of deformed bar are connected by using steel wires and accordingly, there poses a problem in which

method in which a rolled thread portion is formed after finishing the cutting operation for skimming the upset connection end portion.

Incidentally, among them, the first method has been developed by Techniport S.A. and is disclosed in Korean Examined Patent Publication No. 94-8311 and corresponding U.S. Patent 5,158,527 and the second method has been developed by CCL of Great Britain and is disclosed in British Patent 2,286,782 A.

EP 0563490 discloses a method for making a mechanical concrete bar joint and to such a mechanical joint, and to a concrete bar permitting the implementation of the method, and to an installation for preparing concrete bars. The method involves joining at least one concrete bar to another concrete bar, or to an anchoring point, by way of a tapped joining sleeve, the said concrete bar having a nominal cross-section, and at least one reinforced end, turned back and threaded, such that the thread root diameter is equal to or greater than the nominal cross-section of the bar. The reinforced end is obtained by a first axial upsetting permitting an increase in the diameter of the concrete bar, and a second radial pressing during the threading by means of a rolling technique.

However, according to deformed bar worked by the upsetting method, there were problems that the tensile strength and the hardness become extremely high by work hardening and a value of impact absorption energy is rapidly decreased.

Meanwhile, when a metallographic structure (FIG. 6A and FIG. 6B) of an upset connection end portion of deformed bar is compared with a metallographic structure (FIG. 7A and FIG. 7B) of original material, FIG. 6A and FIG. 7A respectively show metallographic structures along the axial direction of the upset material and the original material and it is known that in FIG. 7A, while ferrite and pearlite structures progress long and continuously in the axial direction, in FIG. 6A, the continuity of the metallographic structure in the axial direction is interrupted.

Further, FIG. 6B and FIG. 7B respectively show structures along a direction orthogonal to the axis of the upset and the original materials and it is known that while according to the original material of FIG. 7B, ferrite and pearlite structures are uniformly distributed, according to the upset portion of FIG. 6B, the metallographic

structure is considerably coarsened. Thereby, it is known that the structure of the upset portion is nonuniformly formed.

SUMMARY OF THE INVENTION

In order to resolve the above-described problem, it is an object of the invention to provide a method of working a thread of a connection end portion of deformed bar for

reinforcing concrete ~~and a structure of connecting deformed bar worked in accordance with the method~~.

Further, it is other object of the invention to provide a method of working a connection end portion of deformed bar for reinforcing concrete capable of maintaining a fibrous structure inherent to deformed bar by not carrying out cutting operation and a connection structure of deformed bar obtained by using the method.

Further, it is other object of the invention to provide a method of working a connection end portion of deformed bar for reinforcing concrete for making a structure remain unchanged by not applying heat and a connection structure of deformed bar obtained by using the method.

Further, it is other object of the invention to provide a method of working a connection end portion of deformed bar for reinforcing concrete for compensating for a weakness in a structure caused by work hardening by not upsetting the connection end portion and a connection structure of deformed bar worked by the method.

In order to realize such a problem, according to the invention, there is provided a method of working a connection end portion of deformed bar for reinforcing concrete ~~characterized in~~, the method comprising a swaging step in which ~~in the deformed bar for reinforcing concrete, at least one~~ the connection end portion ~~of the deformed bar for reinforcing concrete~~comprising a cylindrical body having ribs and a number of nodes, is inserted into swaging dies and swaged at a normal temperature such that a maximum diameter of the connection end portion is equal to ~~or slightly larger than a~~ the diameter of ~~a~~ the cylindrical body ~~of the deformed bar~~ or slightly smaller than a diameter of the deformed bar depending on a degree of working; and

a rolling step of forming a thread portion having a diameter substantially equal to a swaging diameter at an outer peripheral face of ~~the~~ at least one connection end portion of the deformed bar which has been subjected to the swaging step.

~~Further, according to the invention, there is provided a deformed bar for reinforcing concrete characterized in that at least one connection end portion is swaged at a normal temperature and a rolled thread portion is formed at the one connection end portion of the deformed bar subjected to the swaging step.~~

~~Further, the invention is featured in a connection structure of a deformed bar for reinforcing concrete in which at least one connection end portion is swaged at a normal temperature and pieces of the deformed bar each formed with a rolled thread portion at an outer peripheral face thereof which has been subjected to the swaging step are connected by a connector having a thread in a mode in correspondence with the rolled thread.~~

BRIEF ~~ESCRIPTION~~DESCRIPTION OF THE DRAWINGS

FIG. 1A through FIG. 1E are stage views showing a method of working a connection end portion of deformed bar for reinforcing concrete according to the invention.

FIG. 2 is a view enlarging a thread portion of FIG. 1E.

FIG. 2A and FIG. 2B are views showing preferred embodiments of thread portions.

FIG. 3A is a metallographic structure diagram along an axial direction of a connection end portion according to the invention.

FIG. 3B is a metallographic structure view along a direction orthogonal to an axis of the connection end portion according to the invention.

FIG. 4 illustrates state views for connecting deformed bar according to the invention by couplers.

FIG. 5 is a state view in which a connection end portion of deformed bar for reinforcing concrete in line with a conventional technology is upset.

~~What is claimed is:~~

Claims

1. A method of working a connection end portion of deformed bar for reinforcing concrete ~~characterized in~~(100), the method comprising a swaging step in which ~~in a cylindrical body of the deformed bar for reinforcing concrete, at least one~~ the connection end portion ~~of the deformed bar in the deformed bar for reinforcing concrete~~(40) comprising a cylindrical body (10) having ribs (30) and a number of nodes ~~is~~(20), is inserted into swaging dies and swaged at a normal temperature such that athe maximum diameter of the connection end portion is equal to ~~or slightly larger than a~~the diameter of the cylindrical body or slightly smaller than a diameter of the deformed bar depending on a degree of working; and

a rolling step of forming a thread portion (60) having a diameter substantially equal to a swaging diameter at an outer peripheral face of the at least one connection end portion of the deformed bar which has been subjected to the swaging step.

2. The method of working a connection end portion of deformed bar for reinforcing concrete according to Claim 1, characterized in that an axis of the connection end portion of the deformed bar which has been subjected to the swaging step is aligned concentrically with an axis of a cylindrical body of the deformed bar formed with the ribs and the nodes.

3. The method of working a connection end portion of deformed bar for reinforcing concrete according to Claim 1, characterized in adding a step of cutting for facing and chamfering a side end face of the connection end portion of the deformed bar subjected to the swaging step.

4. The method of working a connection end portion of deformed bar for reinforcing concrete according to Claim 1, 2, or 3, characterized in that in the rolling step, a groove diameter (63) of a thread ridge at a boundary contiguous to the rib and the node is gradually increased at the thread portion of rolling.

~~5. A deformed bar for reinforcing concrete characterized in that in a cylindrical~~

~~body~~5. The method of ~~a deformed bar for reinforcing concrete, in respect of the deformed bar for reinforcing concrete having ribs and a number of nodes, at least one connection end portion is swaged at a normal temperature and a rolled thread portion is formed at the one connection end portion of the deformed bar subjected to the swaging step.~~

~~6. The~~working a connection end portion of deformed bar for reinforcing concrete according to Claim ~~5~~1,2, 3 or 4, characterized in that the connection end portion is swaged such that ~~a~~ the maximum diameter of the ~~swaged~~ connection end portion ~~becomes substantially~~ is equal to ~~a~~ the diameter of the cylindrical body.

~~7. The deformed bar for reinforcing concrete according to Claim 5, characterized in that an outer diameter of the rolled thread portion is formed to be equal to or slightly larger than a diameter of the cylindrical so body of the deformed bar.~~

~~8. The deformed bar for reinforcing concrete according to Claim 5, characterized in that a groove diameter of a thread ridge at a boundary contiguous to the rib and the node in the rolled thread portion is gradually increased.~~

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Further, in mutually connecting pieces thereof, there is used a latching process in which connection end portions of respective pieces of deformed bar are made to overlap, thereafter, bound by steel wires.

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method in which a rolled thread portion is formed after finishing the cutting operation for skimming the upset connection end portion.

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EP 0563490 discloses a method for making a mechanical concrete bar joint and to such a mechanical joint, and to a concrete bar permitting the implementation of the method, and to an installation for preparing concrete bars. The method involves joining at least one concrete bar to another concrete bar, or to an anchoring point, by way of a tapped joining sleeve, the said concrete bar having a nominal cross-section, and at least one reinforced end, turned back and threaded, such that the thread root diameter is equal to or greater than the nominal cross-section of the bar. The reinforced end is obtained by a first axial upsetting permitting an increase in the diameter of the concrete bar, and a second radial pressing during the threading by means of a rolling technique.

However, according to deformed bar worked by the upsetting method, there were problems that the tensile strength and the hardness become extremely high by work hardening and a value of impact absorption energy is rapidly decreased.

Meanwhile, when a metallographic structure (FIG. 6A and FIG. 6B) of an upset connection end portion of deformed bar is compared with a metallographic structure (FIG. 7A and FIG. 7B) of original material, FIG. 6A and FIG. 7A respectively show metallographic structures along the axial direction of the upset material and the original material and it is known that in FIG. 7A, while ferrite and pearlite structures progress long and continuously in the axial direction, in FIG. 6A, the continuity of the metallographic structure in the axial direction is interrupted.

Further, FIG. 6B and FIG. 7B respectively show structures along a direction orthogonal to the axis of the upset and the original materials and it is known that while according to the original material of FIG. 7B, ferrite and pearlite structures are uniformly distributed, according to the upset portion of FIG. 6B, the metallographic

structure is considerably coarsened. Thereby, it is known that the structure of the upset portion is nonuniformly formed.

SUMMARY OF THE INVENTION

In order to resolve the above-described problem, it is an object of the invention to provide a method of working a thread of a connection end portion of deformed bar for

reinforcing concrete.

Further, it is other object of the invention to provide a method of working a connection end portion of deformed bar for reinforcing concrete capable of maintaining a fibrous structure inherent to deformed bar by not carrying out cutting operation and a connection structure of deformed bar obtained by using the method.

Further, it is other object of the invention to provide a method of working a connection end portion of deformed bar for reinforcing concrete for making a structure remain unchanged by not applying heat and a connection structure of deformed bar obtained by using the method.

Further, it is other object of the invention to provide a method of working a connection end portion of deformed bar for reinforcing concrete for compensating for a weakness in a structure caused by work hardening by not upsetting the connection end portion and a connection structure of deformed bar worked by the method.

In order to realize such a problem, according to the invention, there is provided a method of working a connection end portion of deformed bar for reinforcing concrete, the method comprising a swaging step in which the connection end portion comprising a cylindrical body having ribs and a number of nodes, is inserted into swaging dies and swaged at a normal temperature such that a maximum diameter of the connection end portion is equal to the diameter of the cylindrical body or slightly smaller than a diameter of the deformed bar depending on a degree of working; and

a rolling step of forming a thread portion having a diameter substantially equal to a swaging diameter at an outer peripheral face of at least one connection end portion of the deformed bar which has been subjected to the swaging step.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1A through FIG. 1E are stage views showing a method of working a connection end portion of deformed bar for reinforcing concrete according to the invention.

FIG. 2 is a view enlarging a thread portion of FIG. 1E.

FIG. 2A and FIG. 2B are views showing preferred embodiments of thread portions.

FIG. 3A is a metallographic structure diagram along an axial direction of a connection end portion according to the invention.

FIG. 3B is a metallographic structure view along a direction orthogonal to an axis of the connection end portion according to the invention.

FIG. 4 illustrates state views for connecting deformed bar according to the invention by couplers.

FIG. 5 is a state view in which a connection end portion of deformed bar for reinforcing concrete in line with a conventional technology is upset.

Claims

1. A method of working a connection end portion of deformed bar for reinforcing concrete (100), the method comprising a swaging step in which the connection end portion (40) comprising a cylindrical body (10) having ribs (30) and a number of nodes (20), is inserted into swaging dies and swaged at a normal temperature such that the maximum diameter of the connection end portion is equal to the diameter of the cylindrical body or slightly smaller than a diameter of the deformed bar depending on a degree of working; and

a rolling step of forming a thread portion (60) having a diameter substantially equal to a swaging diameter at an outer peripheral face of the at least one connection end portion of the deformed bar which has been subjected to the swaging step.

2. The method of working a connection end portion of deformed bar for reinforcing concrete according to Claim 1, characterized in that an axis of the connection end portion of the deformed bar which has been subjected to the swaging step is aligned concentrically with an axis of a cylindrical body of the deformed bar formed with the ribs and the nodes.

3. The method of working a connection end portion of deformed bar for reinforcing concrete according to Claim 1, characterized in adding a step of cutting for facing and chamfering a side end face of the connection end portion of the deformed bar subjected to the swaging step.

4. The method of working a connection end portion of deformed bar for reinforcing concrete according to Claim 1, 2, or 3, characterized in that in the rolling step, a groove diameter (63) of a thread ridge at a boundary contiguous to the rib and the node is gradually increased at the thread portion of rolling.

5. The method of working a connection end portion of deformed bar for reinforcing concrete according to Claim 1,2, 3 or 4, characterized in that the connection end portion is swaged such that the maximum diameter of the connection end portion is equal to the diameter of the cylindrical body.

ABSTRACT

METHOD OF WORKING CONNECTION END OF DEFORMED BAR FOR REINFORCING CONCRETE~~, DEFORMED BAR WORKED BY THE METHOD AND STRUCTURE DEFORMED BAR~~

With an object of providing a method of working a connection end portion of deformed bar for reinforcing concrete considerably reducing working expense by enhancing easiness of working by promoting mechanical strength of a connection portion by being able to work the connection portion without destructing a steel skeleton structure of a connection portion between pieces of steel bar, deformed bar worked by the method and a connection structure of deformed bar, the invention provides a method of working a connection end portion of deformed bar for reinforcing concrete, the method ~~featured in~~ comprising a swaging step in which ~~in deformed bar for reinforcing concrete featured in swaging at least a connection end portion at normal temperature and forming a rolled thread portion at an outer peripheral face of the connection end portion of the deformed bar subjected to the swaging step in which at least one~~ the connection end portion comprising a cylindrical body having ribs and a number of nodes, is inserted into swaging dies and ~~is~~ swaged at a normal temperature such that ~~a~~ the maximum diameter of the connection end portion is equal to the ~~or slightly larger than a~~ diameter of ~~a~~ the cylindrical body of the deformed bar or slightly smaller than a diameter of the deformed bar depending on a degree of working; and

a rolling step of forming a thread portion having a diameter substantially equal to a swaging diameter at an outer peripheral face of ~~the~~ at least one connection end portion of the deformed bar which has been subjected to the swaging step.

(Fig. 1E)

ABSTRACT

METHOD OF WORKING CONNECTION END OF DEFORMED BAR FOR REINFORCING CONCRETE

With an object of providing a method of working a connection end portion of deformed bar for reinforcing concrete considerably reducing working expense by enhancing easiness of working by promoting mechanical strength of a connection portion by being able to work the connection portion without destructing a steel skeleton structure of a connection portion between pieces of steel bar, deformed bar worked by the method and a connection structure of deformed bar, the invention provides a method of working a connection end portion of deformed bar for reinforcing concrete, the method comprising a swaging step in which the connection end portion comprising a cylindrical body having ribs and a number of nodes, is inserted into swaging dies and swaged at a normal temperature such that the maximum diameter of the connection end portion is equal to the diameter of the cylindrical body of the deformed bar or slightly smaller than a diameter of the deformed bar depending on a degree of working; and

a rolling step of forming a thread portion having a diameter substantially equal to a swaging diameter at an outer peripheral face of at least one connection end portion of the deformed bar which has been subjected to the swaging step.

(Fig. 1E)