ABSTRACT

A method of production of a welded joint which enables improvement of the fatigue strength in the case where measures for improvement of the fatigue strength cannot be applied due to the presence of structurally sealed regions is provided. The method is provided with a first weld step which performs welding by forming an inside weld toe or root part by using a weld metal with a transformation start temperature of 175°C to 400°C in range, at least parts of the weld metal forming the inside weld toe or root part which was formed at the first weld step becoming unmelted parts, and a second weld step which performs welding for building up the weld metal by a single pass by a weld heat input by which all of the unmelted parts are retransformed to austenite so as to introduce compressive residual stress to the inside weld toe or root part.

CLAIMS

Claim 1

A method of production of a welded joint which welds joining parts of steel materials by multipass welding, the method of production of a welded joint characterized in that said multipass welding comprises a first weld step of welding by a first pass using a welding material with a transformation start temperature of the weld metal of 175°C to 400°C in range and a second weld step of then welding to build up the weld metal by one pass or two passes or more so that parts of the weld metal which was formed in said first weld step become unmelted parts, in which second weld step the weld heat of the final pass causing said unmelted part to completely retransform to austenite.

Claim 2

A method of production of a welded joint which welds joining parts of steel materials by multipass welding, the method of production of a welded joint characterized in that said multipass welding comprises a first weld step of welding by a first pass using a welding material with a transformation start temperature of the weld metal of 175°C to 400°C in range and a second weld step of then welding to build up the weld metal by one pass or two passes or more so that parts of the weld metal which was formed in said first weld step become unmelted parts and has a step of then applying heat treatment which causes said unmelted part to completely retransform to austenite.

Claim 3

A method of production of a welded joint as set forth in claim 1 or 2 characterized by forming the joined part of the welded joint only by welding from one side.

Claim 4

A method of production of a welded joint as set forth in any one of claims 1 to 3 characterized in that said welded joint is a structure where welding is only possible from one side of the welded joint due to the structure of the welded joint or the structure of the welded structure.

Claim 5

A method of production of a welded joint as set forth in any one of claims 1 to 4 characterized in that said welded joint is a T-joint, corner joint, or lap joint.

Claim 6

A method of production of a welded joint as set forth in claim 1, wherein said welded joint is a T-joint, the joined part of the T-joint is comprised of an unwelded zone and weld zones at the two sides sandwiching said unwelded zone, said weld zones are multipass welded from only one side by partial penetration welding, and a length of said unwelded zone is at least 3 times a maximum value of a weld bead thickness of each pass in said multipass welding.

Claim 7

A method of production of a welded joint as set forth in claim 1 wherein said welded joint is a cross joint, the joined part of said cross joint is comprised of an unwelded zone and weld zones at the two sides sandwiching said unwelded zone, said weld zones are multipass welded by partial penetration welding from only one side, and the length of the unwelded zone present between multipass welding operations and the minimum value of the thickness of the steel materials forming the T-joint are at least three times the maximum value of the thickness of the weld bead at each pass in the multipass welding operations.

Claim 8

A method of production of a welded joint as set forth in (2) wherein said welded joint is a T-joint or cross joint, the joined part of said welded joint is comprised of an unwelded zone and weld zones at the two sides sandwiching said unwelded zone, said weld zones are multipass welded by partial penetration welding from only one side, and said heat treatment is performed after finishing the multipass welding operations for all weld zones.

Claim 9

A method of production of a welded joint as set forth in ~~any one of~~ claims 2 ~~to 5 and~~ 8 characterized in that said heat treatment step uses a heating method of either induction heating or ohmic heating.

Claim 10

A method of production of a welded joint as set forth in any one of claims 1 to 9 characterized in that the composition of said weld metal which is used in said first weld step comprises, by mass%, C: 0.01 to 0.15%, Si: 0.2 to 0.8%, Mn: 0.4 to 2.0%, P: 0.03% or less, S: 0.02% or less, and Ni: 7.0 to 11.5% and, furthermore, comprises one or more of Cu: 0.4% or less, Ti: 0.1% or less, Nb: 0.1% or less, V: 0.5% or less, Cr: 3.0% or less, and Mo: 2.0% or less.

Claim 11

A method of production of a welded joint as set forth in any one of claims 1 to 10 characterized in that the composition of said weld metal which is used in said first weld step comprises, by mass%, C: 0.005 to 0.10%, Si: 0.1 to 0.7%, Mn: 0.1 to 2.0%, P: 0.03% or less, S: 0.02% or less, Ni: 4.0 to 8.0%, and Cr: 8.0 to 15.0% and further comprising one or more of Mo: 2.0% or less, Cu:

0.4% or less, Ti: 0.1% or less, Nb: 0.1% or less, and V: 0.5% or less.

Claim 12

A method of production of a welded joint as set forth in any one of claims 1 to 11 characterized by, after said second weld step, grinding a toe part of the weld bead at the welded side for post-treatment.

Claim 13

A method of production of a welded joint as set forth in any one of claims 1 to 11 characterized by, after said second weld step, peening a toe part of the weld bead at the welded side for post-treatment.

Claim 14

A method of production of a welded joint as set forth in any one of claims 1 to 11 characterized by, after said second weld step, reheating by TIG arc welding a toe part of the weld bead at the welded side.

Claim 15

A welded joint which is produced by a method of production of a welded joint as set forth in any one of claims 1 to 14.

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HRISHIKESH RAY CHAUDHURY
OF REMFRY & SAGAR
ATTORNEY FOR THE APPLICANT[S]