CLAIMS

1. A heat transfer enhancement pipe (1) comprising a pipe body (10) of tubular shape having an inlet (100) for entering of a fluid and an outlet (101) for said fluid to flow out; internal wall of the pipe body (10) is welded at a welding site with a fin (11) protruding towards interior of the pipe body (10), wherein the fin (11) has one or more fin sections extending spirally in axial direction of the pipe body (10), and each fin section has a first end surface facing the inlet (100) and a second end surface facing the outlet (101), at least one of the first end surface and the second end surface of at least one of the rib sections is formed as a transition surface along spirally extending direction, to reduce stress of the fin (11) at the welding site during operation.

2. The heat transfer enhancement pipe according to claim 1, the transition surface is a flat face or a curved face.

3. The heat transfer enhancement pipe according to claim 2, characterized in that the first end surface closed to the inlet (100) is formed as a second transition surface.

4. The heat transfer enhancement pipe according to claim 2, characterized in that the second end surface closed to the outlet (101) is formed as a second transition surface.

5. The heat transfer enhancement pipe according to claim 2, characterized in that a top surface (111) of the fin (11) facing a central axis of the pipe body (10) is formed as a third transition surface of concave shape.

6. The heat transfer enhancement pipe according to claim 2, characterized in that the fin (11) is provided with a plurality of fin sections spaced by an interval (12), at least one of a first end surface and a second end surface defined by two side walls (120) of the interval (12) is formed as a fourth transition surface.

7. The heat transfer enhancement pipe according to claim 1, characterized in that the fin (11) is plural in number, and the plurality of the fins (11) as viewed from the direction of the inlet (100) are clockwise or counterclockwise spirals, as viewed from the direction of the inlet (100), the plurality of the fins (11) are enclosed at the center of the pipe body (10) to form a hole (13) extending in the axial direction of the pipe body (10).

8. The heat transfer enhancement pipe according to any one of claims 1 to 7, characterized in that the heat transfer enhancement pipe further comprises a heat insulator (14) which at least partially surrounds the external circumference of the pipe body (10) and is provided at the outside of the pipe body (10).

9. The heat transfer enhancement pipe according to claim 8, characterized in that the heat insulator (14) has a tubular shape, the heat insulator (14) is sleeved on the outside of the pipe body (10), a gap (15) is left between the heat insulator (14) and external wall of the pipe body (10).

10. The heat transfer enhancement pipe according to claim 9, characterized in that a connector for connecting the heat insulator (14) and the pipe body (10) are arranged between the heat insulator (14) and the pipe body (10).

11. The heat transfer enhancement pipe according to claim 10, characterized in that the connector is selected from one or more of the following three structures: the connector includes a first connecting piece (160) that extends in an axial direction parallel to the pipe body (10); the connector includes a second connecting piece (161) that extends spirally along the external wall of the pipe body (10); the connector includes a connecting rod (162) with its two ends respectively connected to the external wall of the pipe body (10) and the internal wall of the heat insulator (14).

12. The heat transfer enhancement pipe according to claim 8, characterized in that the heat insulator (14) comprises a straight pipe section (140), and a first tapered pipe section (141) and a second tapered pipe section (142) respectively connected to the first end and second end of the straight pipe section (140), wherein the first

tapered pipe section (141) is tapered in a direction from close to the first end to away from the first end; the second tapered pipe section (142) is tapered in a direction from close to the second end to away from the second end.

13. The heat transfer enhancement pipe according to any one of claims 1 to 7, characterized in that the heat transfer enhancement pipe further comprises a heat insulating layer (17) which is provided on the external surface of the pipe body (10).

14. The heat transfer enhancement pipe according to claim 13, characterized in that the heat insulating layer (17) comprises a metal alloy layer (170) arranged on the external surface of the pipe body (10) and a ceramic layer (171) located on the metal alloy layer (170).

15. The heat transfer enhancement pipe according to claim 14, characterized in that the heat insulating layer (17) comprises an oxide layer (172) arranged between the metal alloy layer (170) and the ceramic layer (171); and/or the oxide layer (172) is prepared and formed by alumina, silica, titania, or a mixture of any two or more materials from alumina, silica, and titania.

16. The heat transfer enhancement pipe according to claim 14, characterized in that the metal alloy layer (170) is prepared and formed by metal alloy materials including M, Cr, Al, and Y, wherein M is selected from one or more of Fe, Ni, Co, and Al.

17. The heat transfer enhancement pipe according to claim 16, characterized in that the metal alloy layer (170) further comprises additive materials selected from Si, Ti, Co, or Al_2O_3.

18. The heat transfer enhancement pipe according to claim 14, characterized in that the ceramic layer (171) is prepared and formed by one or more materials of yttria-stabilized zirconia, magnesia-stabilized zirconia, calcia-stabilized zirconia, and ceria-stabilized zirconia.

19. The heat transfer enhancement pipe according to claim 13, characterized in that the heat insulating layer (17) comprises a straight section, and a first tapered section and a second tapered section respectively connected to the first end and second end of the straight section, wherein the first tapered section is tapered in a direction from close to the first end to away from the first end; the second tapered section is tapered in a direction from close to the second end to away from the second end.

20. A cracking furnace or atmospheric and vacuum heating furnace, comprising a radiation chamber, in which at least one furnace pipe assembly is installed; the furnace pipe assembly comprises a plurality of furnace pipes (2) arranged in sequence and a heat transfer enhancement pipe communicating adjacent furnace pipes (2); the heat transfer enhancement pipe is the heat transfer enhancement pipe (1) according to any one of the claims 1-19.