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), the fin (11) spirally extends in an axial direction of the pipe body (10), wherein a height of the fin (11) gradually increases from one end in at least a part extension of the fin, to reduce stress of the fin (11) at the welding site during operation.

2. The heat transfer enhancement pipe according to claim 1, characterized in that the height of the fin (11) gradually increases from an end close to the inlet (100).

3. The heat transfer enhancement pipe according to claim 1, characterized in that the height of the fin (11) gradually increases from an end close to the outlet (101).

4. The heat transfer enhancement pipe according to claim 1, characterized in that the height of the fin (11) gradually increases from both ends to the middle.

5. The heat transfer enhancement pipe according to claim 1, characterized in that the height of the fin (11) gradually increases from inlet and/or outlet ends to the middle only in a part extension close to the inlet (100) and/or the outlet (101), and in other parts, the height of the fin (11) varies wavily.

6. The heat transfer enhancement pipe according to claim 1, characterized in that a first end surface (110) of the fin (11) closest to the inlet

(100) is formed as a first transition surface; and/or a second end surface of the fin (11) closest to the outlet (101) is formed as a second transition surface.

7. The heat transfer enhancement pipe according to any one of claims 1 to 6, 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).

8. The heat transfer enhancement pipe according to claim 7, 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).

9. The heat transfer enhancement pipe according to claim 8, characterized in that 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 6, 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.