Claims

1. An underframe side beam, which is an integrally extruded aluminum alloy profile structure, comprising a first layer profile cavity, a second layer profile cavity, a third layer profile cavity and a fourth layer profile cavity, wherein a top portion of the first layer profile cavity is provided with a profile insertion structure for inserting and welding with a side wall of a vehicle body; an inner side surface of the second layer profile cavity is provided with a profile lap-joint structure with an opening, facing an inner side of the vehicle body, at an upper edge; and a bottom transverse wall of the third layer profile cavity is a thickened profile cavity wall, which is used to form a plane structure after the fourth layer profile cavity is partially removed,

wherein an outer surface of the first layer profile cavity is on a same profile surface with outer surfaces of the second layer profile cavity, the third layer profile cavity and the fourth layer profile cavity, and, widths of the second layer profile cavity, the third layer profile cavity and the fourth layer profile cavity are substantially same, a width of the first layer profile cavity is smaller than a width of the second layer profile cavity, the third layer profile cavity and the fourth layer profile cavity, and an inner surface of the first layer profile cavity forms a step portion with inner surfaces of the second layer profile cavity, the third layer profile cavity and the fourth layer profile cavity;

wherein a bottom portion of the fourth layer profile cavity is provided with an embedded slide groove for hanging and mounting a bolt of an under-vehicle apparatus compartment, and an inner side surface of the fourth layer profile cavity is provided with an inside lap-joint structure for lap-welding of an underframe transverse beam;

wherein in a local area where the bogie is connected with the vehicle body, the lower fourth layer profile cavity is removed from the side beam profile by processing, so that a mounting surface of the bogie formed by the underframe side beam, a bolster beam and a traction beam is a plane; and the third layer profile cavity is provided with two die profile cavities in parallel, and a yaw damper seat is mounted through the two die profile cavities.

2. The underframe side beam according to claim 1, wherein in the mounting area of the extra-large under-vehicle apparatus, the lower fourth layer profile cavity is removed from the underframe side beam through processing, and the outer profile is kept for hanging the extra-large under-vehicle apparatus, and except for the mounting area of the bogie, the shape of the underframe of the vehicle body in the length direction of the vehicle body is consistent.

3. The underframe side beam according to claim 2, wherein for the two die profile cavities of the third layer profile cavity arranged side by side, the inner profile cavity is used for hanging and mounting the bolt of extra-large apparatus, and the outer cavity is used for hanging and mounting the bolt of under-vehicle apparatus compartment.

4. The underframe side beam according to claim 3, wherein the mounting bolts of the extra-large under-vehicle apparatus and the mounting bolts of the under-vehicle apparatus compartment are alternatively arranged.

5. The underframe side beam according to any one of claims 1 to 4, wherein one, two or three of under-vehicle high-voltage cables, low-voltage cables and under-vehicle water pipes are mounted in the third layer profile cavity and the fourth layer profile cavity.

6. The underframe side beam according to any one of claims 1 to 4, wherein wall thickness of the first layer profile cavity, the second layer profile cavity, the third layer profile cavity and the fourth layer profile cavity is greater than 8mm, and the thickness of the bottom transverse wall of the die profile cavity is greater than 15mm.

7. An underframe structure, comprising an underframe floor, the side beams according to any one of the claims 1 to 6, transverse beams, bolster beams and traction beams which form an integral bearing structure.

8. The underframe structure according to claim 7, wherein in a mounting area of an extra-large under-vehicle apparatus, the transverse beam is a first transverse beam, and the first transverse beam is connected with the inner side surface of the second layer profile cavity of the side beams on both sides and the upper underframe floor by welding.

9. The underframe structure according to claim 8, wherein a height of the first transverse beam is ranged from 50mm to 65mm.

10. The underframe structure according to claim 7, wherein in a mounting area of a small-scale under-vehicle apparatus, the small-scale under-vehicle apparatus is hung on the second transverse beam, and the second transverse beam is connected with the inner surfaces of the second layer profile cavity, the third layer profile cavity and the fourth layer profile cavity of the underframe side beams on both sides and the upper underframe floor by welding.

11. A rail vehicle, comprising a vehicle body, an underframe and a bogie, wherein the underframe is the underframe structure according to any one of claims 7 to 10.