METAL SIDE-PLATE FOR A RADIATOR

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The invention relates to a metal side-plate for a radiator, in particular a tubular radiator, such as those found in motor vehicles with combustion engines. According to the invention, the metal side-plate (20) is secured to securing points (13) on both sides of the collecting tubes (12) and a longitudinal slot (21) is introduced into the metal side-plate on at least one side in the region of the fixing. The fixing points (13) on the metal side-plates (20) are embodied on collecting tubes (12) on one side of the longitudinal slot.
METAL SIDE-PLATE FOR A RADATOR

CROSS REFERENCES TO RELATED APPLICATIONS

[0001] This application is a National Stage filing of International Application PCT/EP2005/009692, filed Sep. 9, 2005, claiming priority to German Application No. DE 10 2004 045 022.6, filed Sep. 15, 2004, entitled “METAL SIDE-PLATE FOR A RADATOR”. The subject application claims priority to PCT/EP2005/009692 and to German Application No. DE 10 2004 045 022.6 and both references are expressly incorporated by reference herein, in their entirety.

BACKGROUND OF THE INVENTION

[0002] The present invention concerns a metal side-plate for a radiator, especially for tubular radiators, as are used in vehicles with internal combustion engines, for example.

[0003] Such radiators have a radiator body, in which tubes extend in the longitudinal direction, with heat exchange surfaces being formed between the tubes. The radiator body extends in the longitudinal direction between the collecting tubes and cooling air flows through it in the direction transverse to it. The radiator body is closed off by a metal side-plate at the top and bottom, which likewise extends between the collecting tubes and is fastened to them at fixing points.

[0004] When fluctuating operating temperatures occur in the tubular radiator, the length of the tubes and the heat exchange surfaces changes, so that a thermal tensile stress can act on the metal side-plate. A nonuniform thermal expansion will occur between the metal side-plate and edge regions of the radiator body, primarily due to material properties but also caused by nonuniform heating. This nonuniform thermal expansion results in longitudinal and transverse forces acting between radiator body and metal side-plate, thereby introducing loads into the connection regions.

[0005] The problem of the invention is to provide a metal side-plate configured such that the occurrence of stresses caused by different thermal expansion of the metal side-plate and the radiator body is prevented, especially in the direction transverse to the length of the metal side-plate.

[0006] The problem is solved by a metal side-plate according to the present invention.

[0007] A radiator, especially a tubular radiator, has a radiator body that extends in the lengthwise direction between two lateral collecting tubes. The radiator body is bounded by a metal side-plate or by a pair of metal side-plates arranged on either side of the radiator body and extending between the collecting tubes in the longitudinal direction. The metal side-plate is secured at fixing points at one or both sides to the collecting tubes and has a longitudinal slot at least at one side in the region of the fastening, made in the metal side-plate in such a way that the fixing points of the metal side-plate on the collecting tube are fashioned at one side of the longitudinal slot.

[0008] Because of this measure, it becomes possible in an especially favorable manner to absorb the forces introduced in the transverse direction at the metal side-plate and not let them act on the fastening of the metal side-plate to the collecting tube. The transverse slot weakens the metal side-plate in this region, so that bending forces can easily act here and therefore no major forces act on the fastening in the transverse direction, since they are changed into a deformation of the metal side-plate in the region of the longitudinal slot.

[0009] Preferably, it is provided for this that the length of the slot is sufficiently large that the area of weakening becomes soft enough to absorb the forces. For this, in particular, the length of the longitudinal slot is specified to be at least 20 mm.

[0010] The width of the longitudinal slot should also be determined such that the weakening by the longitudinal slot is sufficiently large. In a preferred embodiment for this, the width of the longitudinal slot is at least 2 mm. In an advantageous manner, the width of the longitudinal slot is preferably less than 5 mm, so that the protecting and covering function of the metal side-plate is also ensured in the region of the longitudinal slot.

[0011] One longitudinal slot is advantageously fashioned on each side of the metal side-plate. In this way, the weakening is distributed between the two sides of the metal side-plate.

[0012] In a preferred embodiment of the invention, the metal side-plate has at least one transverse slot besides the longitudinal slot. The transverse slot extends in the plane of the metal side-plate, transversely to the longitudinal direction. The transverse slot increases the softness in the longitudinal direction so that, in particular, forces acting in the longitudinal direction can be absorbed by the transverse slot and not be borne in too large a degree at the fixing points of the metal side-plate. In an advantageous embodiment, at least one transverse slot is provided, but also a small number of transverse slots can be provided, such as 2 or 3 of them.

[0013] The transverse slot can be replaced in the scope of the present invention by any weakening of the metal side-plate. A weakening can also be produced, for example, by a crimp-like embossing of the metal side-plate, which reduces in particular the stiffness of the metal side-plate with respect to lengthwise strain. Such an embossing can also be combined with one or more slots to produce a weakening.

[0014] In a first preferred embodiment, the transverse slot is introduced only after the fastening of the metal side-plate to the radiator body. Due to this procedure, an adequate manipulability of the metal side-plate is ensured before it is fastened onto the radiator body. The transverse slot will divide the metal side-plate in particular into two half plates by extending across the entire width of the metal side-plate. Thus, two totally independent side halves are formed, by which only slight forces will act on the fixing points. For this, one can create a connection between the metal side-plate and radiator body at least in the region of the transverse slot, for example, by brazing.

[0015] According to a second preferred embodiment, the transverse slot is configured as a punch-out running in the transverse direction. In particular, connection ridges are formed on either side of the punch-out. For this, in particular, the connection ridges each have a width of around 5 mm, in order to create a satisfactory shape-stable connection across the region of the punch-out. The connection ridges
can preferably project out from the plane of the metal side-plate, i.e., be raised up in the vertical direction. This ensures a good absorption of forces in the lengthwise direction, while still retaining a sufficient shape stability in the transverse direction for manipulating the metal side-plate. In particular, the punch-out can be a meandering shape. For this, in particular, the punch-out consists of a U-shaped region and has a central slot projecting between the legs of the U-shaped region.

According to another preferred embodiment, two transverse cuts arranged staggered with respect to one another in the lengthwise direction can be provided as the transverse slot. Due to this measure, it is possible to create at least one interruption in the metal side-plate in the lengthwise direction across the entire width of the metal side-plate, while the metal side-plate remains a single piece. In particular, it is provided that each of the transverse cuts projects as far as the edge running in the lengthwise direction, and the combined length of the two transverse cuts is more than the width of the metal side-plate. Thus, an overlap region of the transverse cuts is created in this way, in which two transverse cuts are situated, as viewed along the length of the metal side-plate.

According to one preferred embodiment, the transverse slot is situated more than 100 mm away from the connection site between the metal side-plate and collecting tube. This allows for a twisting of the region between the transverse slot and the connection site under certain conditions, so that the metal side-plate can absorb a torque at least partly and relieve the load on the radiator body or connections between the tube and connecting tube. Advantageously, the transverse slot is situated more than 130 mm, especially more than 150 mm away from the connection site between metal side-plate and collecting tube.

Furthermore, the invention is explained in detail below by means of embodiments presented in the drawings.

BRIEF SUMMARY

A metal side-plate for a radiator is disclosed, in particular a tubular radiator, such as those found in motor vehicles with combustion engines. According to the invention, the metal side-plate is secured to securing points on both sides of the collecting tubes and a longitudinal slot is introduced into the metal side-plate on at least one side in the region of the fixing. The fixing points on the metal side-plates are embodied on collecting tubes on one side of the longitudinal slot.

One object of the present disclosure is to describe an improved metal side-plate for a radiator.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. 1 illustrates, as a diagrammatic, perspective representation, a radiator according to the present invention.

FIG. 2 illustrates, as a partial perspective view, a side piece on a radiator with a transverse slot, according to the present invention.

FIG. 3 illustrates, as a partial perspective view, a side piece with a punched out transverse slot, according to the present invention.

FIG. 4 illustrates, as a partial perspective view, a side piece with a transverse slot consisting of two transverse cuts, according to the present invention.

FIG. 5 illustrates, as a partial perspective view, a side piece with a meandering transverse slot, according to the present invention.

DETAILED DESCRIPTION

For the purposes of promoting an understanding of the disclosure, reference will now be made to the embodiments illustrated in the drawings and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope of the disclosure is thereby intended, such alterations and further modifications in the illustrated device and its use, and such further applications of the principles of the disclosure as illustrated therein being contemplated as would normally occur to one skilled in the art to which the disclosure relates.

FIG. 1 shows a radiator 10 with a radiator body 11, which extends in the lengthwise direction between two collecting tubes 12. Between the collecting tubes 12, the metal side-plate 20 extends at the top and preferably also at the bottom of the radiator body 11. It is fastened to the collecting tubes 12 at fixing points 13 on both sides. The fixing points 13 can be, for example, clips for the collecting tubes that are passed through slots in the metal side-plate, after which they are bent at 90 degrees.

The metal side-plate 20 has a longitudinal slot 21 in the region of each fixing point, which extends in the lengthwise direction of the metal side-plate 20, reaching as far as the edge of the metal side-plate 20, and both longitudinal slots 21 are formed on the same side of the respective fixing point 13. Distributed over the length of the metal side-plate 20 are two transverse cuts 22, being configured in FIG. 1 as meandering punch-outs.

FIGS. 2 to 5 show magnified features of a radiator, such as or similar to radiator 10, showing different configurations of the transverse slots 22 in a metal side-plate, such as or similar to metal side-plate 20, except as specifically noted. Each time, the fixing point 13 of the metal side-plate 20 on the collecting tube 12 is also shown.

FIG. 2 shows a transverse slot 22 running in the transverse direction, being made in the metal side-plate in particular after the fastening of the metal side-plate 20 to the radiator 10. The transverse slot here divides the metal side-plate into independent half plates 24.

FIG. 3 shows a transverse slot 22, formed as a punch-out 23, with connection ridges 25 formed on either side of the punch-out, especially running at the edge 28 of the metal side-plate 20. The connection ridges 25 are raised up especially in the height direction and have a triangular appearance in view.

FIG. 4 shows a transverse slot 22, made from two transverse cuts 29. The transverse cuts 29 are staggered relative to one another in the lengthwise direction and, taken together, extend far beyond the overall width of the metal side-plate 20. They run as far as the edge 26 of the metal side-plate 20 on either side.

FIG. 5 shows another configuration of a transverse slot 21. Here, two base slots 30 are formed, running in the
lengthwise direction, lateral to which there are connection ridges 25, which are raised up in the vertical direction. From the base slots 30 project transverse cuts 29, producing a U-shaped cut pattern at one side and the other transverse cut 29 juts from the other base slot 30 and juts centrally in between the other two transverse cuts 29. In this way, a meandering shape is produced for the metal side-plate in the region of the transverse slot 21.

[0034] While the preferred embodiment of the invention has been illustrated and described in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character, it being understood that all changes and modifications that come within the spirit of the invention are desired to be protected.

1. A metal side-plate for a radiator (10), especially a tubular radiator, wherein the radiator has a radiator body (11), which extends in the lengthwise direction between two lateral collecting tubes (12), wherein the radiator body (11) is bounded by at least one metal side-plate (20), in particular by a pair of metal side-plates (20) arranged on either side of the radiator body (11) and extending between the collecting tubes (12) in the longitudinal direction, characterized in that said metal side-plate (20) is secured at fixing points (13) to a collecting tube (12) and a longitudinal slot (21) is made in said metal side-plate at least on one side in a region adjacent a fixing point, said fixing points (13) of the metal side-plate (20) to the collecting tube (12) being constructed and arranged on one side of said longitudinal slot.

2. The metal side-plate of claim 1, wherein the length of the longitudinal slot (21) is at least 20 mm.

3. The metal side-plate of claim 2, wherein the width of the longitudinal slot (21) is at least 2 mm and preferably less than 5 mm.

4. The metal side-plate of claim 3, wherein one longitudinal slot (21) is fashioned on each side of the metal side-plate (20).

5. The metal side-plate of claim 4, wherein the metal side-plate (20) has at least one transverse slot (22), which extends in the plane of the metal side-plate (20), transversely to the longitudinal direction.

6. The metal side-plate of claim 5, wherein the transverse slot (22) is introduced only after the fastening of the metal side-plate (20) to the radiator body (11), whereby the transverse slot (22) divides the metal side-plate (20) in particular into two half plates (24).

7. The metal side-plate of claim 5, wherein the transverse slot (22) is configured as a punch-out (23) running in the transverse direction, while connection ridges (25) are provided on either side of the punch-out (23), and the connection ridges (25) preferably project out from the plane of the metal side-plate (20).

8. The metal side-plate of claim 7, wherein the punch-out (23) is a meandering shape.

9. The metal side-plate of claim 5, wherein two transverse cuts (29) are arranged staggered relative to one another in the lengthwise direction and are provided as the transverse slot (22), each of the transverse cuts (29) projecting as far as the edge (28) running in the lengthwise direction, and the combined length of the two transverse cuts (29) is more than the width of the metal side-plate.

10. The metal side-plate of claim 9, wherein that the transverse slot is situated more than 100 mm, especially more than 130 mm and especially preferably more than 150 mm, away from a fixing point (13).

11. A radiator (10), especially a tubular radiator, wherein the radiator has a radiator body (11), which extends in the lengthwise direction between two lateral collecting tubes (12), wherein the radiator body (11) is bounded by at least one metal side-plate (20), in particular by a pair of metal side-plates (20) arranged on either side of the radiator body (11) and extending between the collecting tubes (12) in the longitudinal direction, characterized in that the metal side-plate (20) is secured at fixing points (13) to a collecting tube (12) or at both sides to the collecting tubes (12) and a longitudinal slot (21) is made in the metal side-plate at least on one side in the region of the fastening, and the fixing points (13) of the metal side-plate (20) to the collecting tube (12) are fashioned on one side of the longitudinal slot.

12. A heat exchanger unit with a first and a second heat exchanger, wherein the first heat exchanger has a first radiator body (11), which extends in the lengthwise direction between two first lateral collecting tubes (12), wherein the second heat exchanger has a second radiator body, which extends in particular in the longitudinal direction between two second lateral collecting tubes, wherein the first and the second radiator bodies form a radiator body unit, especially with corrugated fins configured as a single piece and assigned to the two radiator bodies, that are bounded by at least one metal side-plate (20), in particular by a pair of metal side-plates (20) arranged on either side of the radiator body unit and extending between the first and second collecting tubes (12) in the longitudinal direction, characterized in that the metal side-plate (20) is secured at fixing points (13) to a first and/or second collecting tube (12) or at both sides to the collecting tubes (12) and a longitudinal slot (21) is made in the metal side-plate at least on one side in the region of the fastening, and the fixing points (13) of the metal side-plate (20) to the collecting tube (12) are fashioned on one side of the longitudinal slot.

13. The metal side-plate of claim 1, wherein the width of the longitudinal slot (21) is at least 2 mm and preferably less than 5 mm.

14. The metal side-plate of claim 13, wherein one longitudinal slot (21) is fashioned on each side of the metal side-plate (20).

15. The metal side-plate of claim 1, wherein the metal side-plate (20) has at least one transverse slot (22), which extends in the plane of the metal side-plate (20), transversely to the longitudinal direction.

16. The metal side-plate of claim 15, wherein that the transverse slot is situated more than 100 mm, especially more than 130 mm and especially preferably more than 150 mm, away from a fixing point (13).