A heat exchanger for thermal energy engine comprises a hollow casing, a hollow top-plate, a hollow bottom-plate and a replaceable heat-exchanging medium. The hollow top-plate and the hollow bottom-plate have a plurality of air-ventilating orifices and arranged on a topside and a bottom side of the hollow casing, respectively. The replaceable heat-exchanging medium is placed within an accommodating space confined by the hollow casing, the hollow top-plate, and the hollow bottom-plate and provides heat-accumulation function to air flowing through the orifices and passing the heat-exchanging medium, whereby thermal loss is reduced.
HEAT EXCHANGER FOR THERMAL ENERGY ENGINE

FIELD OF THE INVENTION

[0001] The present invention relates to a heat exchanger for thermal energy engine, especially to a heat exchanger for thermal energy engine with replaceable heat-exchanging medium.

BACKGROUND OF THE INVENTION

[0002] The heat exchanger is mainly used for heat accumulation and for reducing thermal loss. The conventional heat exchange generally comprises a casing containing a metal mesh therein. A colder region is placed on one side of the casing and a hotter side is placed on another side of the casing. When a hot air flows from the hotter side to the metal mesh, the metal mesh is heated by the hot air. On the contrary, when a cold air flows from the colder side to the metal mesh, the cold air is heated by the metal mesh. Therefore, the heat exchanger can be used for reducing thermal loss.

[0003] However, in above-mentioned heat exchanger, the metal mesh is permanently installed in casing and tended to have degenerated problem after long time usage. The performance of the heat exchanger is degraded.

SUMMARY OF THE INVENTION

[0004] It is an object of the present invention to provide a heat exchanger for thermal energy engine, which has replaceable heat-exchanging medium to ensure the performance of heat accumulation effect.

[0005] It is another object of the present invention to provide a heat exchanger for thermal energy engine, which has simple structure and better heat accumulation effect.

[0006] To achieve above object, the present invention provides a heat exchanger for thermal energy engine, which comprises a hollow casing, a hollow top-plate, a hollow bottom-plate and a replaceable heat-exchanging medium. The hollow top-plate and the hollow bottom-plate have a plurality of air-ventilating orifices and arranged on a topside and a bottom side of the hollow casing, respectively. The replaceable heat-exchanging medium is placed within an accommodating space confined by the hollow casing, the hollow top-plate, and the hollow bottom-plate. The heat exchanger forms a porous frame and the replaceable heat-exchanging medium provides heat-accumulation function to air flowing through the orifices and passing the heat-exchanging medium, whereby thermal loss is reduced.

[0007] The various objects and advantages of the present invention will be more readily understood from the following detailed description when read in conjunction with the appended drawing, in which:

BRIEF DESCRIPTION OF DRAWING

[0008] FIG. 1 shows a perspective view of the present invention;
[0009] FIG. 2 shows a sectional view of the present invention;
[0010] FIG. 3 is a sectional view depicting the air flowing path in the present invention;
[0011] FIG. 4 is an exploded view showing the inventive heat exchanger being applied to a thermal energy engine; and
[0012] FIG. 5 is a sectional view showing the inventive heat exchanger being applied to a thermal energy engine.

DETAILED DESCRIPTION OF THE INVENTION

[0013] FIGS. 1 and 2 show the perspective view and the sectional view of the present invention, respectively. The present invention provides a heat exchanger for a thermal energy engine and the heat exchanger comprises a hollow casing 1, a hollow top-plate 3, a hollow bottom-plate 5 and a replaceable heat-exchanging medium 7.

[0014] The hollow casing 1 has an annulus shape and the hollow top-plate 3 is arranged on topside of the hollow casing 1. The hollow top-plate 3 has a central aperture 31 and a plurality of air-ventilating orifices 31 around the central aperture 31. The hollow bottom-plate 5 is arranged on bottom side of the hollow casing 1. The hollow bottom-plate 5 has a central aperture 51 and a plurality of air-ventilating orifices 51 around the central aperture 51. The replaceable heat-exchanging medium 7 is placed within an accommodating space confined by the hollow casing 1, the hollow top-plate 3, and the hollow bottom-plate 5. The replaceable heat-exchanging medium 7 can be selected from a group consisting of metal wire, ceramic material, copper wire and silver wire. Moreover, the central aperture 31 of the hollow top-plate 3 and the central aperture 51 of the hollow bottom-plate 5 are matched with the annulus shape of the hollow casing 1.

[0015] By above-mentioned configuration, the heat exchanger of the present invention is a porous frame. As shown in FIG. 3, the air flowing through the air-ventilating orifices 31 and 51 passes through the heat-exchanging medium 7. The heat-exchanging medium 7 provides heat-accumulation function and reduces thermal loss.

[0016] FIGS. 4 and 5 are an exploded view and a sectional view showing the inventive heat exchanger being applied to a thermal energy engine. The thermal energy engine 9 comprises a cylinder 91 and a piston assembly 92 arranged within the cylinder 91. The cylinder 91 comprises a front barrel 911, a middle barrel 912, a rear barrel 913 and a plurality of rings 914. The piston assembly 92 comprises a first valving piston 921, a power piston 922, a second valving piston 923, a spindle 924, a countershaft 925 and a flywheel 926. The inventive heat exchanger is provided between the middle barrel 912 and the piston assembly 92 to provide heat accumulation effect for the thermal energy engine 9.

[0017] The operational principle of the thermal energy engine 9 is as follows:

[0018] The air in the cylinder 91 has variable volume due to temperature variation and the piston assembly 92 is pushed by the air with variable volume. An external thermal source (not shown) is provided outside the front barrel 911 to heat the air in the cylinder 91. Moreover, a heat radiator 9121 is provided at outer surface of the middle barrel 912 to cool the air in the cylinder 91. Therefore, the air in the cylinder 91 is subjected to the cycle of heating and cooling operation and the volume is increased and decreased. As a
result, the first valving piston 921, the power piston 922, and the second valving piston 923 have reciprocating movement along the spindle 924. The power piston 922 and the second valving piston 923 have spiral grooves 927 on the outer wall thereof to drive the flywheel 926 to rotate.

Moreover, the inventive heat exchanger is functioned to provide heat accumulation effect for the thermal energy engine 9. When hot air flows from the hollow top-plate 3 to the hollow bottom-plate 5, the hot air heats the replaceable heat-exchanging medium 7. When cool air flows from the hollow bottom-plate 5 to the hollow top-plate 3, the replaceable heat-exchanging medium 7 heats the cool air. Therefore, the thermal loss can be reduced. Moreover, the heat-exchanging medium 7 is replaceable to ensure the performance of heat accumulation effect and the thermal energy engine 9 will have better efficiency.

To sum up, the heat exchanger for thermal energy engine according to the present invention has following features:

(1) Simple structure and better heat accumulation effect.

(2) Replaceable heat-exchanging medium to ensure the performance of heat accumulation effect.

Although the present invention has been described with reference to the preferred embodiment thereof, it will be understood that the invention is not limited to the details thereof. Various substitutions and modifications have suggested in the foregoing description, and other will occur to those of ordinary skill in the art. Therefore, all such substitutions and modifications are intended to be embraced within the scope of the invention as defined in the appended claims.

I claim:

1. A heat exchanger for thermal energy engine, comprising
   a hollow casing;
   a hollow top-plate arranged on a topside of the hollow casing and having a central aperture and a plurality of air-ventilating orifices around the central aperture;
   a hollow bottom-plate arranged on bottom side of the hollow casing and having a central aperture and a plurality of air-ventilating orifices around the central aperture; and
   a replaceable heat-exchanging medium placed within an accommodating space confined by the hollow casing, the hollow top-plate, and the hollow bottom-plate;
   the heat exchanger forming a porous frame and the replaceable heat-exchanging medium providing heat-accumulation function to air flowing through the orifices and passing the heat-exchanging medium, whereby thermal loss is reduced.

2. The heat exchanger for thermal energy engine as in claim 1, wherein the hollow casing is of annulus shape.

3. The heat exchanger for thermal energy engine as in claim 2, wherein the central aperture of the hollow top-plate and the central aperture of the hollow bottom-plate are matched with the annulus shape of the hollow casing.

4. The heat exchanger for thermal energy engine as in claim 1, wherein the replaceable heat-exchanging medium is selected from a group consisting of metal wire, ceramic material, copper wire and silvery wire.

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