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(54) **COMPOSITE HEATER CORE FOR VEHICLES**

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(57) **ABSTRACT**

A composite heater apparatus for vehicles uses integrated tube which is partitioned from a coolant heater core tube part, in which coolant circulates, and an oil cooler tube part, in which engine oil circulates, and includes heat exchanging fin which is in contact with both the coolant heater core tube part and the oil cooler tube part to perform a heat exchanging process. Each header, which is coupled to each of opposite ends of the core tube, is partitioned from coolant circulation space and oil circulation space, via a partition walls. The partition wall includes a surface enlarging member to increase heat exchanging performance using heat conduction. When a vehicle is started in winter, in the initial operation stage of an engine, the vehicle is quickly heated, using the heat of engine oil which is heated prior to engine coolant.

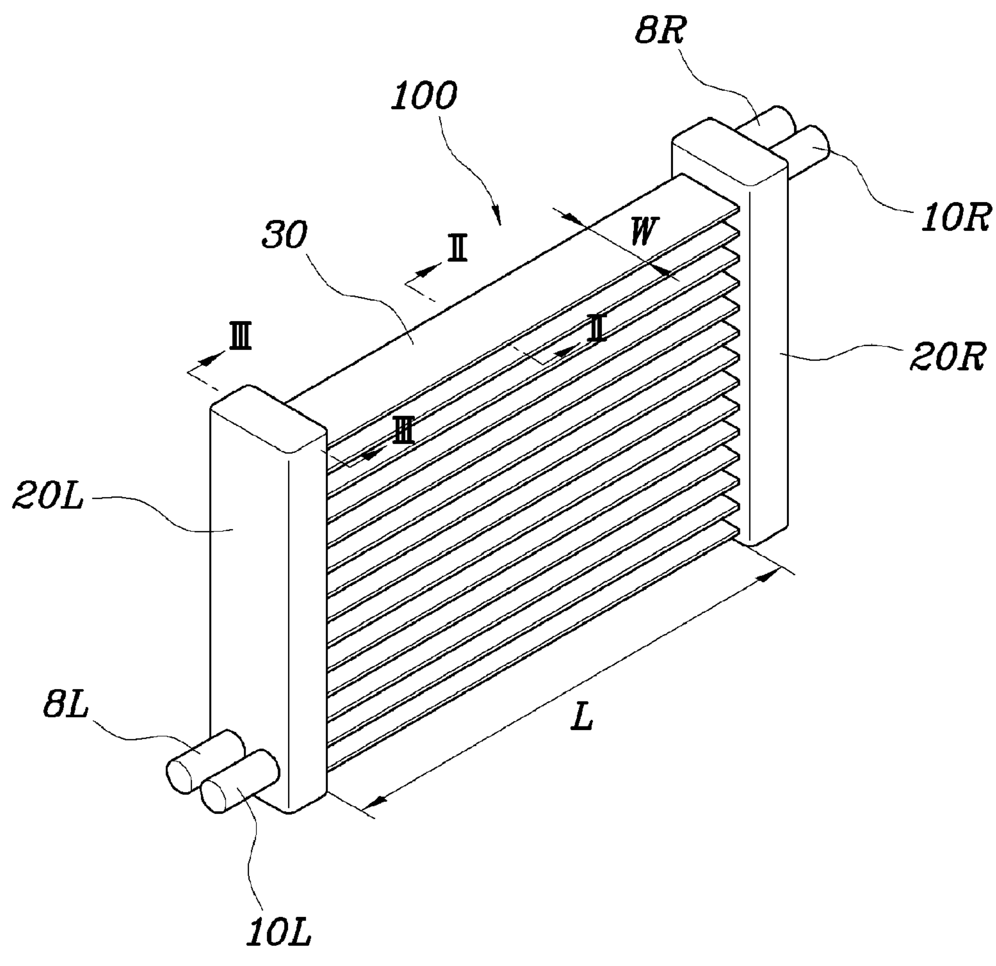


FIG. 1

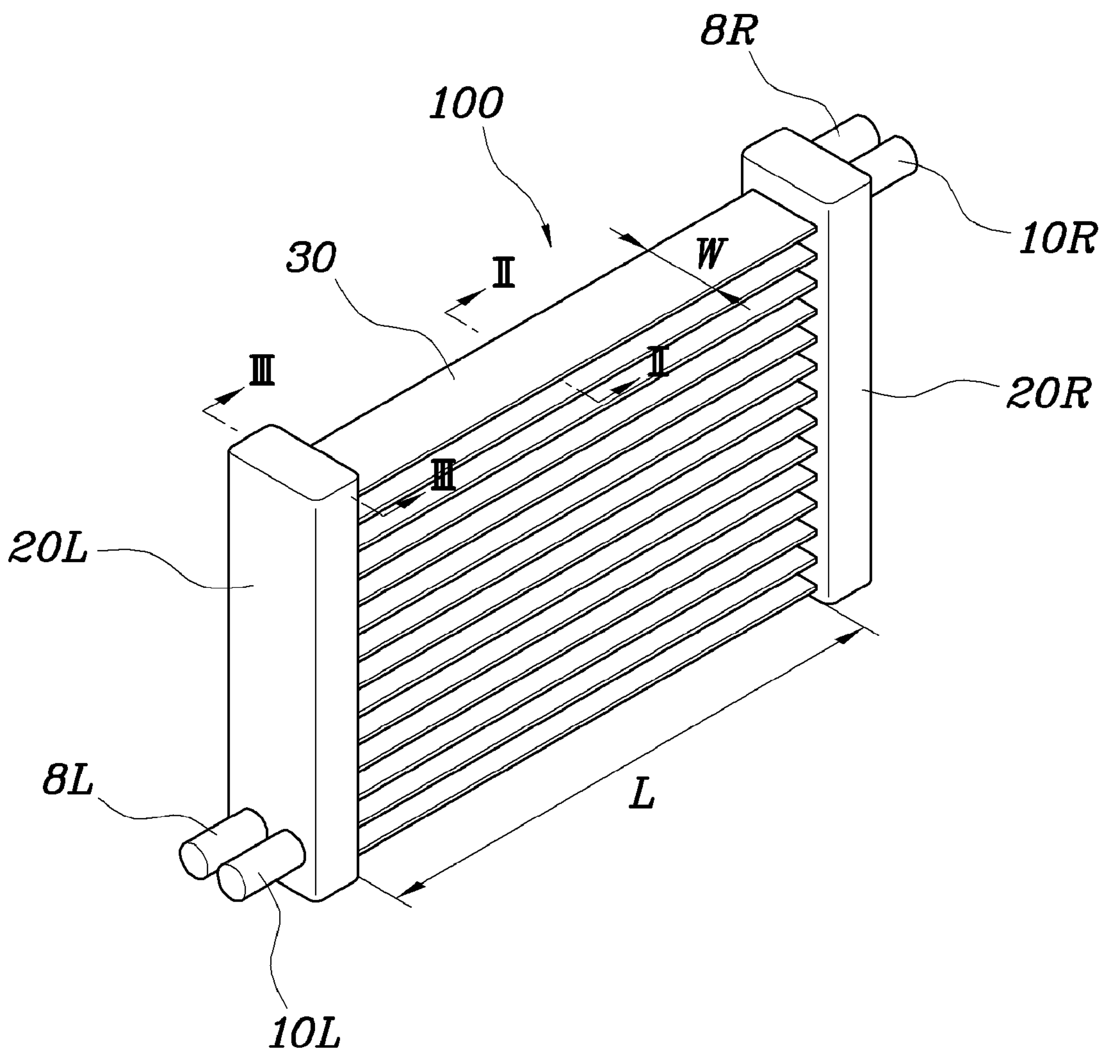


FIG. 2

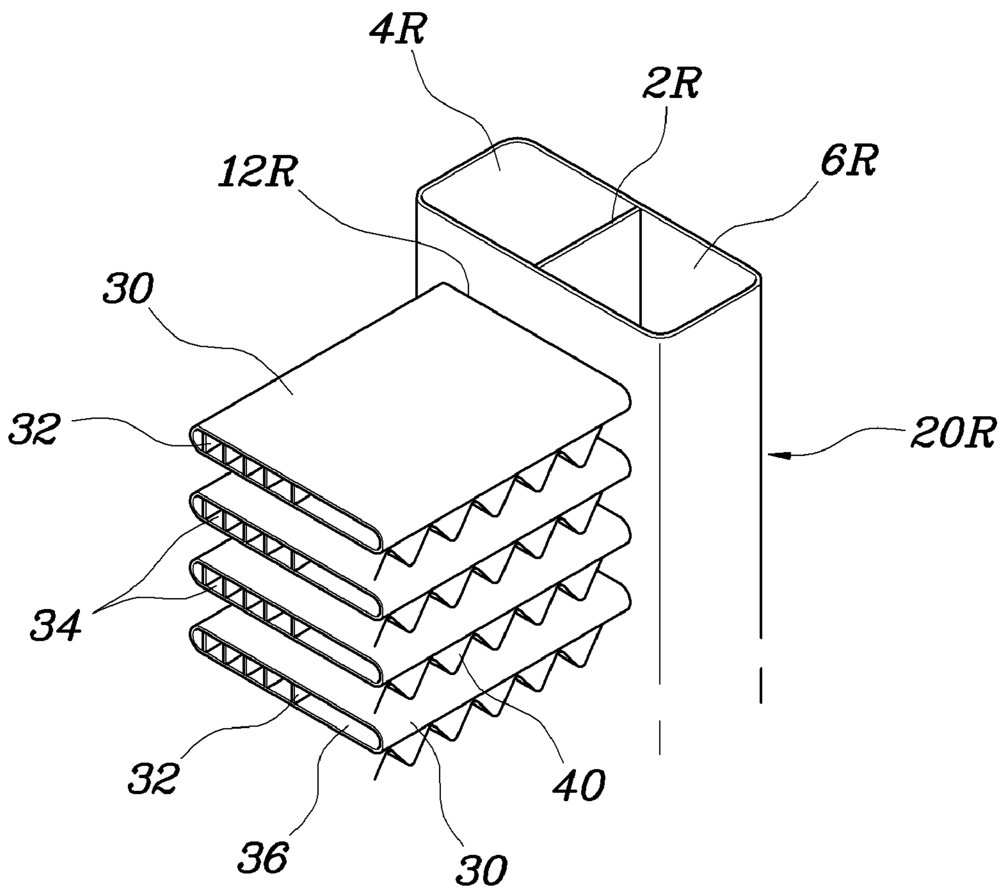


FIG. 3

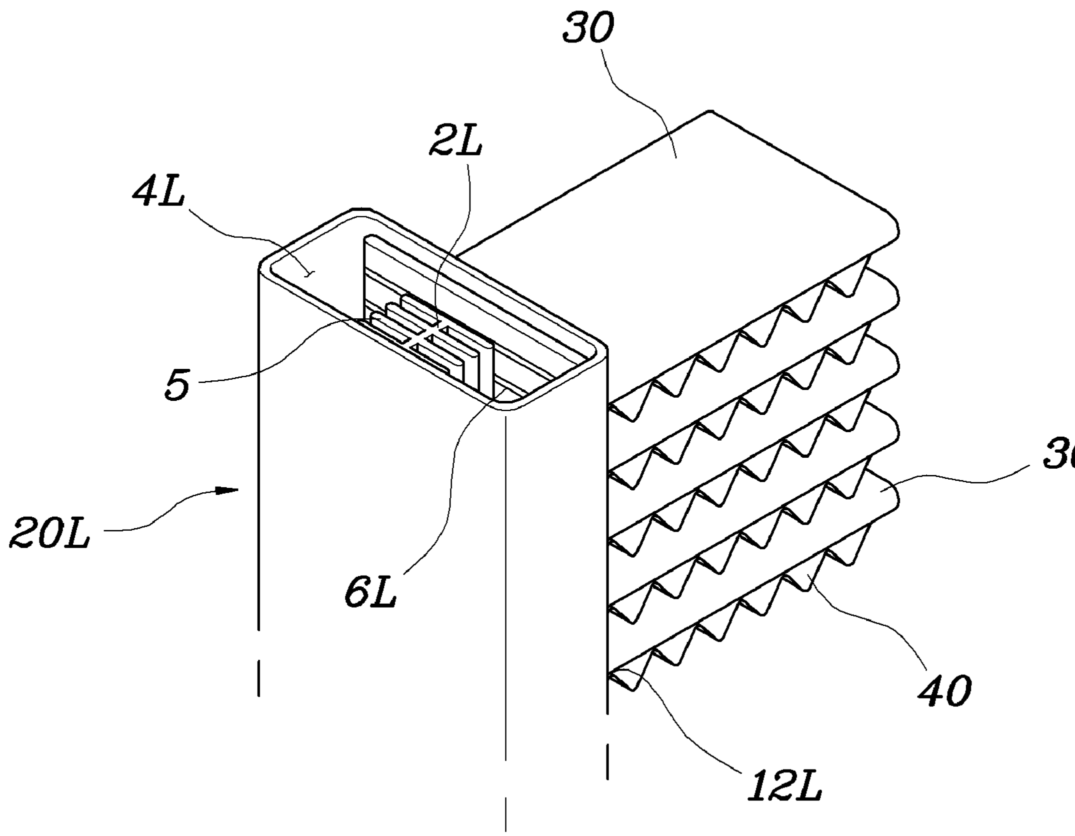


FIG. 4

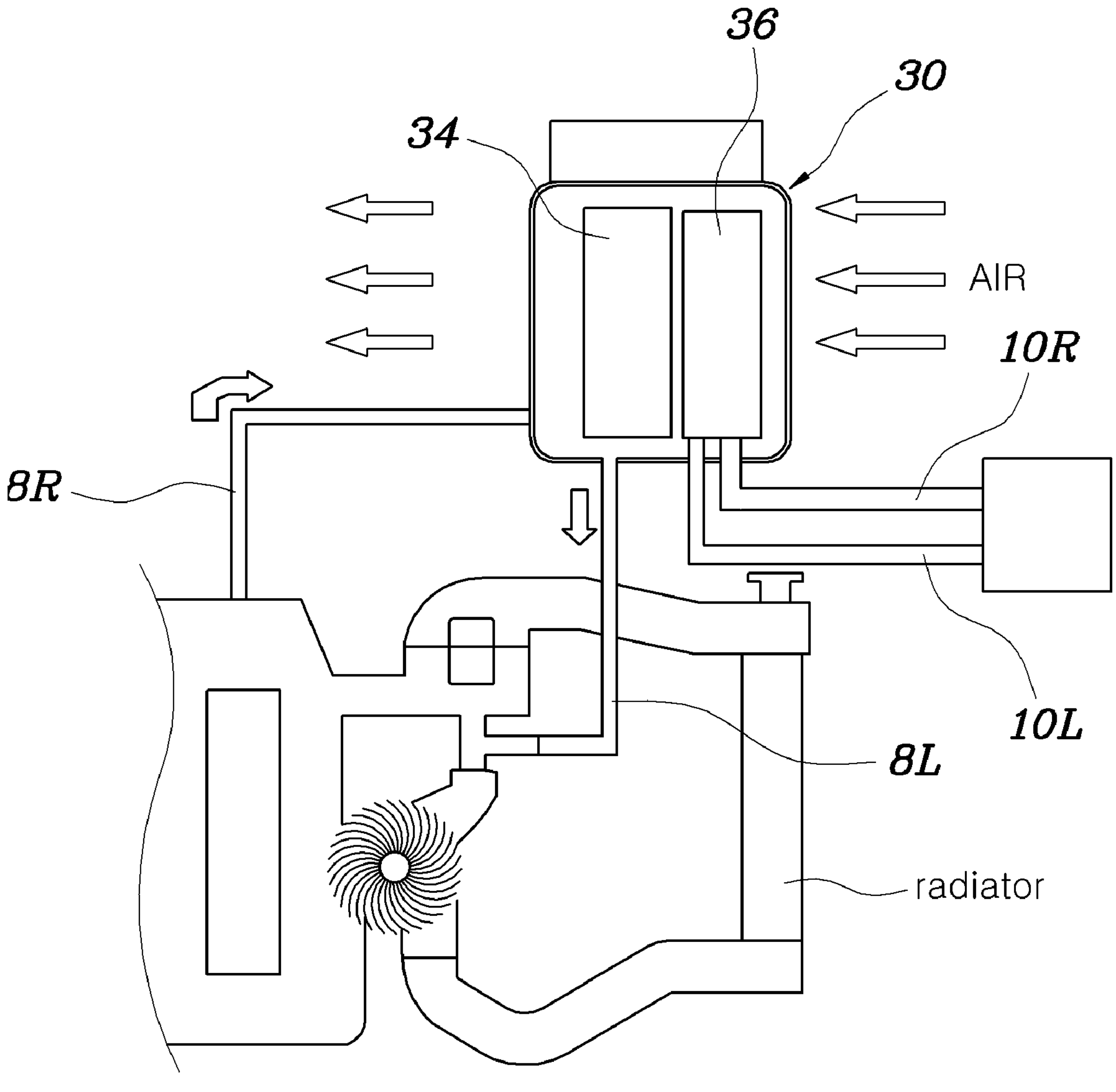
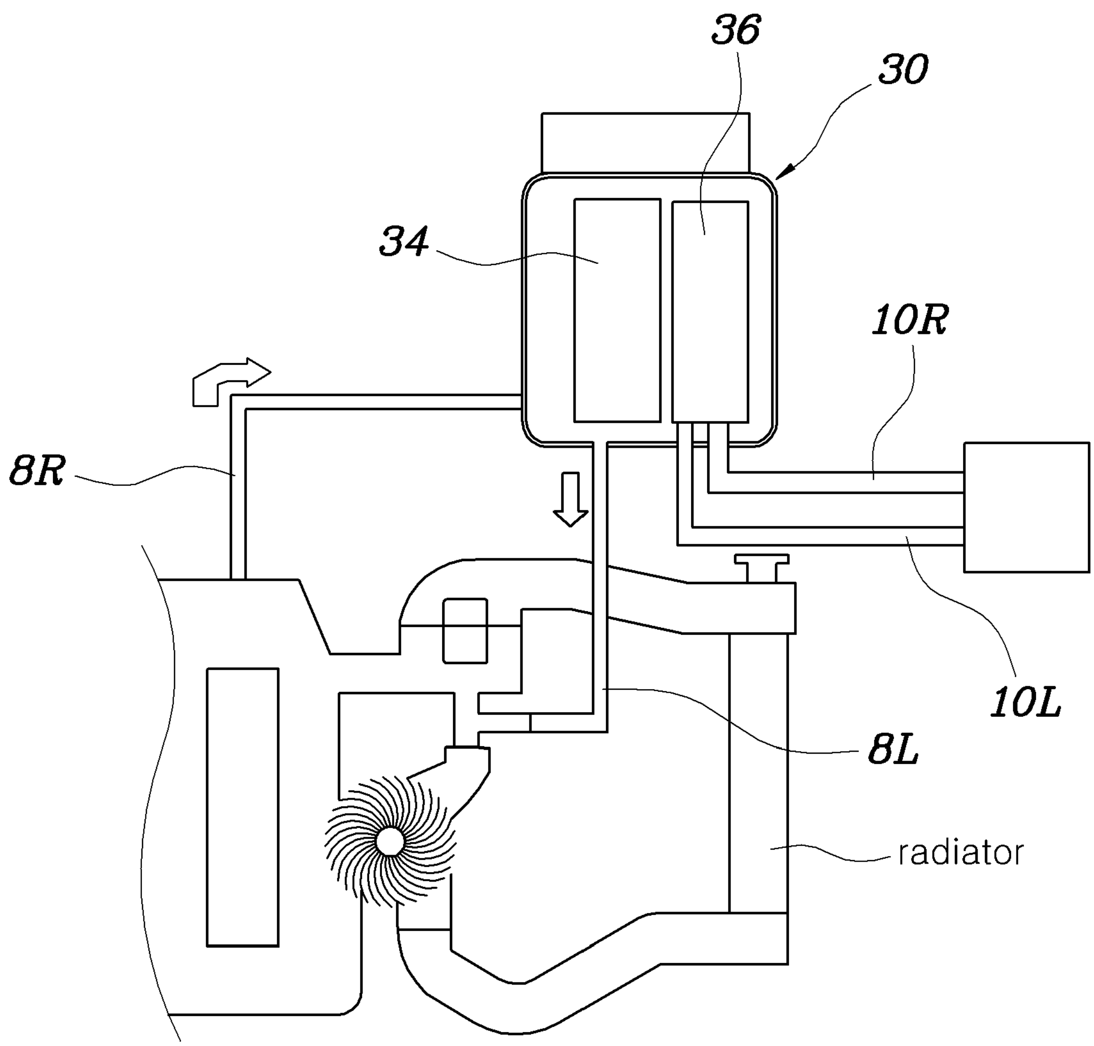


FIG. 5



COMPOSITE HEATER CORE FOR VEHICLES

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application claims priority to Korean Application No. 10-2007-0129300 filed Dec. 12, 2007, the entire contents of which application is incorporated herein for all purposes by this reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates generally to a composite heater apparatus for vehicles and, more particularly, to a heating apparatus for vehicles, which is intended to heat a cabin of a vehicle, using the heat of engine oil which is heated prior to engine coolant, before the engine coolant reaches a predetermined temperature after the vehicle has been started.

[0004] 2. Description of Related Art

[0005] Generally, a heating apparatus is installed in a vehicle to heat the cabin of the vehicle. The heating apparatus is operated as follows. That is, while heated coolant of an engine circulates through a heater core in an air conditioning box, outdoor or indoor air passes through the heater core. During this process, the heat of the heated coolant flowing in the heater core is transferred to the air. The hot air is introduced into the vehicle, thus heating the cabin of the vehicle.

[0006] However, the traditional heater core for vehicles is problematic in that, when the heat of an engine in a vehicle rises to a certain point, coolant reaches a proper temperature, and, when the heated coolant passes through the heater core, a proper heat exchanging process is performed, so that the heating effect is not immediately obtained in the initial operation stage of the engine in the winter.

[0007] Further, since engines for vehicles which have been produced recently have high energy efficiency, the temperature of coolant is not very high even while the engine is being driven. As related technology is developed, a method of increasing heating efficiency has been proposed by selectively blocking the flow of coolant to an oil cooler using a conventional valve for piping so that the coolant is bypassed to a heater core and coolant having a larger amount of heat is supplied to the heater core. However, the method has a drawback in that the cooling operation of the oil cooler is temporarily stopped using an additional coolant direction control valve, so that the cooling operation of the oil cooler is hindered, and the construction of a heating system is complicated, and it is impossible to heat a vehicle using the heat of the oil cooler.

[0008] Meanwhile, in order to increase the heating performance of a vehicle, a plurality of oil cooler units is installed in a vehicle, and one of the oil cooler units is installed in a heater unit. This construction allows the heat of engine oil to be used to heat the vehicle. However, only one of the oil cooler units is installed in the heater unit, and the remaining oil cooler units are installed outside the heater unit. Thus, this construction is problematic in that the engine oil is not appropriately cooled in the case where the heater is not used, so that the engine may overheat.

[0009] The information disclosed in this Background of the Invention section is only for enhancement of understanding of the general background of the invention and should not be taken as an acknowledgement or any form of suggestion that this information forms the prior art already known to a person skilled in the art.

BRIEF SUMMARY OF THE INVENTION

[0010] Various aspects of the present invention are directed to provide a heating apparatus for vehicles capable of efficiently heating a vehicle using engine oil, which rises more rapidly in temperature than coolant, in an initial stage.

[0011] In an aspect, a composite heater core for vehicles, of the present invention may include a first header partitioned into a coolant inlet space and an oil inlet space by a longitudinal partition wall, with a coolant inlet pipe and an oil inlet pipe connected to the coolant inlet space and the oil inlet space respectively, and including a plurality of inlet through-slots which are provided in a sidewall of the first header in a longitudinal direction thereof, a second header partitioned into a coolant outlet space and an oil outlet space by a longitudinal partition wall, with a coolant outlet pipe and an oil outlet pipe connected to the coolant outlet space and the oil outlet space respectively, and including a plurality of outlet through-slots which are provided in a sidewall of the second header in a longitudinal direction thereof, a plurality of fluid tubes, each of the fluid tubes being connected at a first end thereof to an associated inlet through-slot and being connected at a second end thereof to an associated outlet through-slot such that the first and second headers communicate with each other, each of the fluid tubes being partitioned by one partition wall to form a coolant path and an oil path so that the coolant inlet space of the first header communicates with the coolant outlet space of the second header through the coolant path, and the oil inlet space of the first header communicates with the oil outlet space of the second header through the oil path respectively, and/or a heat exchanging member arranged between outer circumferences of the fluid tubes.

[0012] The coolant input pipe and the oil inlet pipe may be displaced higher than the coolant outlet pipe and the oil outlet pipe with a predetermined distance.

[0013] The composite heater core may further include a flow resistance control member formed in the coolant path so as to control flow speed of coolant therein. The flow resistance control member may include a partition wall formed in the coolant path in a longitudinal direction of the fluid tube.

[0014] The composite heater core may further include a flow resistance control member formed in the oil path so as to control flow speed of oil therein. The flow resistance control member may include a partition wall formed in the oil path in a longitudinal direction of the fluid tube.

[0015] The longitudinal partition wall provided in the first header, may further include a surface enlarging member to enlarge a surface area of the longitudinal partition wall. The surface enlarging member may include a plurality of fins formed in a longitudinal direction thereof and extending toward the coolant inlet space. The surface enlarging member may include a plurality of fins formed in a longitudinal direction thereof and extending toward the oil inlet space.

[0016] The longitudinal partition wall provided in the second header, may further include a surface enlarging member to enlarge a surface area of the longitudinal partition wall. The surface enlarging member may include a plurality of fins formed in a longitudinal direction thereof and extending toward the coolant outlet space. The surface enlarging member may include a plurality of fins formed in a longitudinal direction thereof and extending toward the oil outlet space.

[0017] The heat exchanging member may include a plurality of fins and is fixed to the outer circumferences of the fluid tubes therebetween.

[0018] The heat exchanging member may be corrugated in a traverse direction of the fluid tube so as to guide air between the fluid tubes.

[0019] The coolant path and the oil path may be monolithically provided in the fluid tube in the longitudinal direction thereof.

[0020] The methods and apparatuses of the present invention have other features and advantages which will be apparent from or are set forth in more detail in the accompanying drawings, which are incorporated herein, and the following Detailed Description of the Invention, which together serve to explain certain principles of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] FIG. **1** is a perspective view showing the external appearance of an exemplary composite heater core for vehicles, according to the present invention.

[0022] FIGS. **2** and **3** are perspective views partially showing components taken along lines II-II and III-III of FIG. **1** respectively.

[0023] FIGS. **4** and **5** are views showing the operation of an exemplary composite heater core for vehicles according to the present invention, in winter and summer respectively.

DETAILED DESCRIPTION OF THE INVENTION

[0024] Reference will now be made in detail to various embodiments of the present invention(s), examples of which are illustrated in the accompanying drawings and described below. While the invention(s) will be described in conjunction with exemplary embodiments, it will be understood that present description is not intended to limit the invention(s) to those exemplary embodiments. On the contrary, the invention (s) is/are intended to cover not only the exemplary embodiments, but also various alternatives, modifications, equivalents and other embodiments, which may be included within the spirit and scope of the invention as defined by the appended claims.

[0025] For the convenience of description, when two components are a pair of symmetrical components, the character 'R' (designating a right component) or 'L' (designating a left component) is appropriately added to the reference numeral.

[0026] FIG. **1** is a perspective view showing the external appearance of a composite heater core for vehicles, according to the present invention, and FIGS. **2** and **3** are perspective views partially showing components taken along lines II-II and III-III of FIG. **1** respectively.

[0027] As shown in FIGS. **1** to **3**, a composite heater apparatus **100** for vehicles according to the present invention includes a first header **20**R, a second header **20**L, a plurality of fluid tubes **30**, and heat exchanging fins **40**. The first header **20**R is partitioned into a coolant inlet space **4**R and an oil inlet space **6**R by a longitudinal partition wall **2**R, with a coolant inlet pipe **8**R and an oil inlet pipe **10**R connected to the coolant inlet space **4**R and the oil inlet space **6**R respectively. A plurality of inlet through-slots **12**R is provided a sidewall of the first header **20**R in the longitudinal direction thereof, and communicates with the coolant inlet space **4**R and the oil inlet space **6**R. The second header **20**L is partitioned into a coolant outlet space **4**L and an oil outlet space **6**L by a longitudinal partition wall **2**L, with a coolant outlet pipe **8**L and an oil outlet pipe **10**L connected to the coolant outlet space **4**L and the oil outlet space **6**L respectively. A plurality of outlet through-slots **12**L is provided in a sidewall of the second header **20**L in the longitudinal direction thereof, and communicates with the coolant outlet space **4**L and the oil outlet space **6**L. One end of each fluid tube **30** is connected to an associated inlet through-slot **12**R, while the other end of the fluid tube **30** is connected to an associated outlet through-slot **12**L. Thereby, the first header **20**R and the second header **20**L are connected to each other in such a way as to communicate with each other. Each fluid tube **30** is partitioned into several fine coolant paths **34** by at least one partition wall **32**, so that the coolant inlet space **4**R of the first header **20**R communicates with the coolant outlet space **4**L of the second header **20**L via the fine coolant paths **34**. The oil inlet space **6**R of the first header **20**R communicates with the oil outlet space **6**L of the second header **20**L via an oil path **36** in each fluid tube **30**.

[0028] Further, the heat exchanging fins **40** are arranged between the outer circumferences of the fluid tubes **30**. In various embodiments of the present invention, the heat exchanging fins **40** are corrugated in a traverse direction of the fluid tube **30** so as to permit air to flow smoothly between the fluid tubes **30**.

[0029] Preferably, each fluid tube **30** is manufactured through a single extrusion process using a single type of material, for example, aluminum, so that the coolant paths **34** and the oil path **36** are integrally provided in the fluid tube **30** in the longitudinal direction thereof. The heat dissipation fins **40**, which are arranged on the outer circumferential surfaces of the tubes, are provided throughout the entire width W and length L of the fluid tubes **30**. Thus, the composite heater apparatus **100** for vehicles according to the present invention has very simple construction, and has similar appearance to the conventional heater core.

[0030] In order to increase the heat exchanging efficiency between the air and the fluid passing through the coolant path **34** and the oil path **36** which are provided in each tube **30** in such a way as to be partitioned from each other in the longitudinal direction of the tube **30**, for example, as shown in FIG. **2**, the coolant path **34** may be partitioned into fine paths by a plurality of partition walls **32**. FIG. **2** illustrates an exemplary embodiment in which the oil path **36** is not partitioned into fine paths. However, the present invention is not limited to the various embodiments shown in the drawings, but the size and number of each path or fine path can be appropriately changed according to the heat exchanging efficiency, in consideration of the viscosity and line resistance of each fluid.

[0031] Preferably, the composite heater apparatus **100** for vehicles according to the present invention further includes a surface enlarging member **5**, which is provided on the longitudinal partition walls **2**R and/or **2**L installed in each of the first header **20**R and/or second header **20**L.

[0032] The surface enlarging member **5** increases the surface area of the longitudinal partition walls **2**R and/or **2**L. The surface enlarging member **5** may comprise a plurality of protruding pins which extend from inner lateral sides of the longitudinal partition walls **2**R and/or **2**L to a coolant circulation spaces formed in elements **4**R and/or **4**L and an oil circulation spaces formed in elements **6**R and/or **6**L. However, the present invention is not limited to the various embodiments shown in the drawings, but the size and number of each pin and direction can be appropriately changed according to the heat exchanging efficiency, in consideration of the viscosity and line resistance of each fluid.

[0033] The surface enlarging member **5** increases the contact area between the oil flowing in the oil circulation spaces formed in elements **6**R and/or **6**L and the coolant in the coolant circulation spaces formed in elements **4**R and/or **4**L, thus efficiently transferring the heat of oil to the coolant through conduction.

[0034] FIGS. **4** and **5** are views showing how the heat exchanging operation of the composite heater apparatus **100** for vehicles according to the present invention is performed in winter and summer respectively.

[0035] The operation of heating the vehicle in winter using the composite heater apparatus **100** for vehicles according to the present invention will be described below with reference to FIGS. **2** to **4**.

[0036] When a vehicle is started and the engine is running, in the initial stage, the temperature of the engine oil rises more quickly than the coolant. The heated engine oil is introduced into the oil inlet space **6**R of the first header **20**R through the oil inlet pipe **10**R. Thereafter, the engine oil passes through the oil path **36** of each fluid tube **30**, and is collected in the oil outlet space **6**L of the second header **20**L, prior to being discharged through the oil outlet pipe **10**L. During this process, the heat exchanging process is performed between the oil passing through the fluid tube **30** and the air passing through the heat exchanging fins **40** which are attached to the outer circumferential surfaces of the fluid tubes **30**, so that the oil is cooled. The heated air is introduced into the vehicle, thus heating the cabin of the vehicle.

[0037] Meanwhile, while the engine oil undergoes the heat exchanging process, the coolant, which has not reached a predetermined temperature yet, is introduced into the coolant inlet space **4**R of the first header **20**R through the coolant inlet pipe **8**R, in the same manner as the oil. Subsequently, the coolant flows through the coolant path **34** of each fluid tube **30** and is collected in the coolant outlet space **4**L of the second header **20**L, prior to being discharged through the coolant outlet pipe **8**L. However, since the temperature of the coolant is still low, the amount of heat transferred to the air is small, and thus the heating efficiency is insufficient.

[0038] However, as described above, in the initial operation stage of the engine when the temperature of the coolant is not very high, the insufficient heating effect is compensated for by the heat exchanging process of the oil, thus reducing the time required to heat the vehicle in the initial operation stage of the engine in winter.

[0039] The operation of the composite heater apparatus **100** according to the present invention will be described with reference to FIG. **5**, when it is not necessary to heat the vehicle, for example, as in the summer.

[0040] That is, when the vehicle is started and the engine is driven, the temperature of the engine oil is increased by the operation of the engine. The heated engine oil is introduced into the oil inlet space **6**R of the first header **20**R through the oil inlet pipe **10**R, and thereafter, flows through the oil path **36** of each fluid tube **30** into the oil outlet space **6**L of the second header **20**L.

[0041] Subsequently, while the engine oil is discharged through the oil outlet pipe **10**L, the air does not pass between the heat exchanging fins **40** which are attached to the outer circumferences of the fluid tubes **30**, so that the vehicle is not heated. The heat of the oil is transferred to the coolant flowing in the coolant path **34** of each fluid tube **30** via the heat exchanging fins **40**, which are attached to the outer circumferences of the fluid tubes **30**, through conduction, so that the oil is cooled. Further, the heat of the oil is transferred to the coolant flowing in the coolant circulation spaces formed in element **4**R and/or **4**L defined in each header via the surface enlarging member **5** which is provided on the partition wall in each of the first and second headers, through conduction, so that the oil is cooled.

[0042] As such, the composite heater core for vehicles according to the present invention performs both the operation of heating the vehicle using the heat of the engine oil and the operation of cooling the overheated engine oil, by means of one integrated heat exchanging apparatus, so that an additional apparatus for heating the vehicle or cooling the engine oil is not required, thus immediately achieving the heating effect of the heating apparatus, and considerably reducing the cost of manufacturing the heating apparatus.

[0043] As described above, the present invention provides a heating apparatus for vehicles, which is capable of efficiently heating a vehicle using the heat of engine oil, in an initial operation stage of an engine.

[0044] Further, the present invention provides a heating apparatus for vehicles, in which the operation of heating a vehicle using the heat of engine oil and the operation of cooling overheated engine oil are simultaneously performed using one apparatus, so that an additional apparatus for heating the vehicle or cooling the engine oil is not required, thus remarkably reducing the cost of manufacturing the heating apparatus.

[0045] For convenience in explanation and accurate definition in the appended claims, the terms “left”, “right”, “outside”, and etc. are used to describe features of the exemplary embodiments with reference to the positions of such features as displayed in the figures.

[0046] The foregoing descriptions of specific exemplary embodiments of the present invention have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the invention to the precise forms disclosed, and obviously many modifications and variations are possible in light of the above teachings. The exemplary embodiments were chosen and described in order to explain certain principles of the invention and their practical application, to thereby enable others skilled in the art to make and utilize various exemplary embodiments of the present invention, as well as various alternatives and modifications thereof. It is intended that the scope of the invention be defined by the Claims appended hereto and their equivalents.

What is claimed is:

1. A composite heater core for a vehicle, comprising:

a first header partitioned into a coolant inlet space and an oil inlet space by a longitudinal partition wall, with a coolant inlet pipe and an oil inlet pipe connected to the coolant inlet space and the oil inlet space respectively, and comprising a plurality of inlet through-slots which are provided in a sidewall of the first header in a longitudinal direction thereof;

a second header partitioned into a coolant outlet space and an oil outlet space by a longitudinal partition wall, with a coolant outlet pipe and an oil outlet pipe connected to the coolant outlet space and the oil outlet space respectively, and comprising a plurality of outlet through-slots which are provided in a sidewall of the second header in a longitudinal direction thereof;

a plurality of fluid tubes, each of the fluid tubes being connected at a first end thereof to an associated inlet through-slot and being connected at a second end thereof to an associated outlet through-slot such that the first and second headers communicate with each other, each of the fluid tubes being partitioned by one partition wall to form a coolant path and an oil path so that the coolant inlet space of the first header communicates with the coolant outlet space of the second header through the coolant path, and the oil inlet space of the first header communicates with the oil outlet space of the second header through the oil path respectively; and

a heat exchanging member arranged between outer circumferences of the fluid tubes.

2. The composite heater core as set forth in claim **1**, wherein the longitudinal partition wall provided in the first header, further comprises a surface enlarging member to enlarge a surface area of the longitudinal partition wall.

3. The composite heater core as set forth in claim **2**, wherein the surface enlarging member includes a plurality of fins formed in a longitudinal direction thereof and extending toward the coolant inlet space.

4. The composite heater core as set forth in claim **2**, wherein the surface enlarging member includes a plurality of fins formed in a longitudinal direction thereof and extending toward the oil inlet space.

5. The composite heater core as set forth in claim **1**, wherein the longitudinal partition wall provided in the second header, further comprises a surface enlarging member to enlarge a surface area of the longitudinal partition wall.

6. The composite heater core as set forth in claim **5**, wherein the surface enlarging member includes a plurality of fins formed in a longitudinal direction thereof and extending toward the coolant outlet space.

7. The composite heater core as set forth in claim **5**, wherein the surface enlarging member includes a plurality of fins formed in a longitudinal direction thereof and extending toward the oil outlet space.

8. The composite heater core as set forth in claim **1**, wherein the heat exchanging member comprises a plurality of fins and is fixed to the outer circumferences of the fluid tubes therebetween.

9. The composite heater core as set forth in claim **1**, wherein the heat exchanging member is corrugated in a traverse direction of the fluid tube so as to guide air between the fluid tubes.

10. The composite heater core as set forth in claim **1**, wherein the coolant path and the oil path are monolithically provided in the fluid tube in the longitudinal direction thereof.

11. A composite heater apparatus for a vehicle, comprising:

a first header partitioned into a coolant inlet space and an oil inlet space by a longitudinal partition wall, with a coolant inlet pipe and an oil inlet pipe connected to the coolant inlet space and the oil inlet space respectively, and comprising a plurality of inlet through-slots which are provided in a sidewall of the first header in a longitudinal direction thereof;

a second header partitioned into a coolant outlet space and an oil outlet space by a longitudinal partition wall, with a coolant outlet pipe and an oil outlet pipe connected to the coolant outlet space and the oil outlet space respectively, and comprising a plurality of outlet through-slots which are provided in a sidewall of the second header in a longitudinal direction thereof,

a plurality of fluid tubes, each of the fluid tubes being connected at a first end thereof to an associated inlet through-slot and being connected at a second end thereof to an associated outlet through-slot such that the first and second headers communicate with each other, each of the fluid tubes being partitioned by one partition wall to form a coolant path and an oil path so that the coolant inlet space of the first header communicates with the coolant outlet space of the second header through the coolant path, and the oil inlet space of the first header communicates with the oil outlet space of the second header through the oil path respectively; and

a heat exchanging member arranged between outer circumferences of the fluid tubes.

* * * * *