A heat conduction unit having an improved laminar is provided. The heat conduction unit of the present invention includes a pair of exhaust and intake layers crossing each other for exchanging heat between exhaust and intake airflows; and a laminar interposed between the exhaust and intake layers and having a fiber synthetic fabric layer with a high water absorbancy and heat conductivity. The fiber synthetic fabric layer is made by densely weaving a microfiber in the form of a fabric, the fabric being weaved by adding micro metal fiber, by adding microfiber plated with metal, or by adding at least ones of micro copper molecules, aluminum molecules, carbon black molecules, carbon nano tube molecules, titanium dioxide (TiO2) molecules, and nano-silver molecules, to a raw material resin of the microfiber.
OUTDOOR

INTAKE FRESH OUTDOOR AIR

CONTAMINATED INDOOR AIR

EXHAUST CONTAMINATED INDOOR AIR

FRESH OUTDOOR AIR

[Fig. 1]

[Fig. 2]
HEAT CONDUCTION UNIT WITH IMPROVED LAMINAR

TECHNICAL FIELD

[0001] The present invention relates to a heat conduction unit that is capable of improving thermal conductivity and performance reliability.

BACKGROUND ART

[0002] A heat exchanger is a device for preventing the indoor temperature from changing abruptly and maintaining the indoor humidity using sensible and latent heat exchanges during air ventilation. Such heat exchanger is provided with exhaust and intake passages crossing each other, exhaust and intake fans for generating the exhaust and intake airflows through the respective exhaust and intake passages, and a heat conduction unit arranged at the crossing part of the exhaust and intake passage for heat and moisture exchanges between the exhaust and intake airflows.

[0003] Korean Patent Laid-Open Publication No. 2003-004007 discloses a heat conduction element. The conventional heat conduction element is provided with basic components each of which is formed by laminating a laminar having a flat shape and a spacer having a corrugated section of sinusoidal shape.

[0004] The spacers are joined with the laminars interposed therebetween with their direction of corrugation orthogonal to each other alternately so as to form exhaust and intake airflow layers. With this structure, if the exhaust and intake fans are activated, the exhaust airflow is guided out of the room through the exhaust passage layer and the intake airflow is guided into the room through the intake passage layer, such that the exhaust and intake airflows exchange heats and moisture via the laminars.

[0005] Accordingly, the laminar should be fabricated so as to have high conductivity for efficiently exchanging the heat between the exhaust and intake airflows while protecting mixture of the exhaust and intake airflows, and high moisture permeability for efficient moisture exchange between the exhaust and intake airflows.

[0006] In a case of cellulose laminar fabrication, a cellulose fiber is processed in the form of a paper through beating and pressing processes. In order to improve the adhesive force between the fibers thermosetting resin such as melamine resin, urea resin, and epoxised polyamide are applied as a reinforcement additive. In this case, however, porosity of the laminar is dramatically reduced through the beating/pressing process and reinforcement process. In order to improve the moisture permeability of the laminar, an alkali metal such as lithium chloride is added through an impregnation process after the reinforcement process.

[0007] Accordingly, the conventional laminar fabrication is carried out through complicated additional processes including reinforcement process and absorbent agent application process in addition to the basic shaping process, and these additional processes cause a environment contamination problems due to the toxicity of the additive materials.

[0008] Also, the conventional laminar is likely to have a low porosity due to the use of large amount of reinforcement agent, even though it may be compensated by the absorbent agent, which restricts the efficient moisture exchange performance of the laminar. Particularly, the polypropylene (PP) laminar made of high polymer film material is inferior to the cellulose laminar in moisture exchange efficiency.

[0009] In a case of cellulose laminar, the impregnated absorbent likely be partially removed from the laminar while using the heat conductive unit equipped with the laminar so as to contaminate the indoor atmosphere. Also, the difference of thermal expansion rate between the cellulose and reinforcement material deteriorate the vulnerable water resistance of the laminar, thereby being fragile in a high temperature and high moisturized environment, resulting in degrading the product reliability.

[0010] In order to solve these problems, a high density fabric type laminar has been proposed. However, this conventional laminar has a problem in that the exhaust and intake airflows are likely to be mixed due to its high air permeability.

DISCLOSURE OF INVENTION

Technical Problem

[0011] The present invention has been made in an effort to solve the above problems, and the present invention provides a heat conduction unit having an improved laminar that is capable of improving the moisture permeability as well as heat conductivity and additionally securing durability and antibacterial effect that are not expected in the conventional humidity-exchangeable laminar products made of paper material.

[0012] Also, the present invention provides a heat conduction unit that is capable of being adaptive to various usage environments by implementing a laminar composed at least one of fiber synthetic fabric layer and a high polymer resin layer in a single- or multi-layered form and selectively applying the laminar with an inventive spacer or a conventional spacer.

Technical Solution

[0013] In one aspect of the present invention, a heat conduction unit of the present invention includes a pair of exhaust and intake layers crossing each other for exchanging heat between exhaust and intake airflows; and a laminar interposed between the exhaust and intake layers and having a fiber synthetic fabric layer with a high water absorbancy and heat conductivity.

[0014] Preferably, the fiber synthetic fabric layer is made by densely weaving a microfiber in the form of a fabric, the fabric being woven by adding micro metal fiber, by adding microfiber plated with metal, or by adding at least ones of micro copper molecules, aluminium molecules, carbon black molecules, carbon nano tube molecules, titanium dioxide (TiO2) molecules, and nano-silver molecules, to a raw material resin of the microfiber.

[0015] In accordance with another aspect of the present invention, a heat conduction unit includes a pair of exhaust and intake layers crossing each other for exchanging heat between exhaust and intake airflows and laminar interposed between the exhaust and intake layers, where the laminar includes a fiber synthetic fabric layer having a high water absorbancy and high heat conductivity; and at least one higher polymer resin layer laminated or coated on at least one surface of the fiber synthetic fabric layer.

[0016] Preferably, the laminar is composed by forming the fiber synthetic fabric layer on one or both surfaces of the high polymer resin layer or by forming the high polymer resin layer on one or both surface of the fiber synthetic fabric layer.
 Preferably, the high polymer resin layer is composed of at least one of temperature sensitive high polymer resin layer of which micro pores and channels increase in proportion to the temperature, high moisture permeable high polymer resin layer, high moisture permeable and air shield ability polymer resin layer, and high thermal conductive high polymer resin layer.

 Preferably, the high polymer resin layer is made of at least one of polypropylene (PP), polyethylene (PE), polyester, polyvinyl chloride (PVC), polyurethane (PU), polyimide, polyamide, polysulfone, polysiloxane, polyethylene-terephthalate (PET), nylon, and Teflon.

 Preferably, the high polymer resin layer is formed by doping at least ones of micro copper molecules, aluminum molecules, carbon black molecules, carbon nano tube molecules, titanium dioxide (TiO2) molecules, and nano-silver molecules, to a raw material resin in the laminating or coating process.

 In accordance with another aspect of the present invention, a heat conduction unit includes a pair of exhaust and intake layers crossing each other for exchanging heat between exhaust and intake airflows; and a laminar interposed between the exhaust and intake layers and having a having a high polymer resin layer with a high moisture permeability, wherein the laminar has flat surfaces or at least one furrowed surface.

 Preferably, the high polymer resin layer includes at least one of temperature sensitive high polymer resin layer of which micro pores and channels increase in proportion to the temperature, high moisture permeable high polymer resin layer, high moisture permeable and air shield ability polymer resin layer, and high thermal conductive high polymer resin layer.

 Preferably, the high polymer resin layer is made of at least one of polypropylene (PP), polyethylene (PE), polyester, polyvinyl chloride (PVC), polyurethane (PU), polyimide, polyamide, polysulfone, polysiloxane, polyethylene-terephthalate (PET), nylon, and Teflon.

 Preferably, the high polymer resin layer is formed by doping at least ones of micro copper molecules, aluminum molecules, carbon black molecules, carbon nano tube molecules, titanium dioxide (TiO2) molecules, and nano-silver molecules, to a raw material resin in the laminating or coating process.

 advantageous effects

 The heat conduction unit of the present invention is manufactured using a laminar implemented with a composite material of a high water absorbent fabric and a coated resin having a high moisture permeability and air shield ability, thereby improving the heat and moisture exchange performance with enhanced moisture permeability and water repellent effect while avoiding the contamination controversy caused by the reinforcement and absorbent materials used in the fabrication of conventional heat conductive unit.

 Also, the heat conduction unit of the present invention is advantageous in product reliability and durability since the laminar of the heat conduction unit has improved water resistance even in the high temperature and high moisturized environment and improved air shield ability in comparison with the cellulose or fabric material to protect the mixture of the exhaust and intake airflows.

 Also, the heat conduction unit of the present invention is advantageous in heat conductivity improved by applying micro fiber coated with metal fiber or metal itself such as silver fiber to the fiber fabric layer of the laminar. The addition of micro molecules such as nano-silver, carbon black, and carbon nano-tube to the high polymer molecules of the micro fiber fabric further improves the heat conductivity and provides antibacterial and bactericidal effects.

 BRIEF DESCRIPTION OF THE DRAWINGS

 The above and other objects, features and advantages of the present invention will be more apparent from the following detailed description in conjunction with the accompanying drawings, in which:

 FIG. 1 is a top plan view illustrating a heat exchanger according to an exemplary embodiment of the present invention;

 FIG. 2 is a perspective view illustrating the heat conduction unit of FIG. 1;

 FIG. 3 is a perspective view illustrating a laminar of a heat conduction unit according to an exemplary embodiment of the present invention; and

 FIG. 4 is a perspective view illustrating a laminar of a heat conduction unit according to another exemplary embodiment of the present invention.

 BEST MODE FOR CARRYING OUT THE INVENTION

 Exemplary embodiments of the present invention are described with reference to the accompanying drawings in detail. The same reference numbers are used throughout the drawings to refer to the same or like parts. Detailed descriptions of well-known functions and structures incorporated herein may be omitted to avoid obscuring the subject matter of the present invention.

 FIG. 1 is a top plan view illustrating a heat exchanger according to an exemplary embodiment of the present invention. Referring to FIG. 1, the heat exchanger 5 includes a housing 10 having a box shape and a pair of exhaust and intake passages 16 and 17 for guiding exhaust and intake airflows 14 and 15, respectively.

 The heat exchanger further includes a heat conduction unit 13 arranged at a portion at which the exhaust and intake passages 16 and 17 are crossing each other for exchanging heats between the exhaust and intake airflows 14 and 15, and a pair of exhaust and intake fans 12 and 11.

 If the exhaust and intake fans 12 and 11 are activated, the indoor air is forced so as to be guided out through the exhaust passage 16, and the outdoor air is forced so as to be guided into the room through the intake passage 17. The exhaust and intake airflows 14 and 15 exchanges heats while crossing at the heat conduction unit 13, thereby reducing heat loss and, in turn, protecting abrupt change of the indoor temperature.

 FIG. 2 is a perspective view illustrating the heat conduction unit of FIG. 1. As shown in FIG. 2, the heat conduction unit 13 includes basic components each of which is formed by laminating a laminar 24 having a flat shape and a spacer 23 having a corrugated section of sinusoidal shape. The spacers are joined with the laminars interposed therebetween with their direction of corrugation orthogonal to each other alternately so as to form at least one exhaust layer 21 communicating with the exhaust passage 16 and at least one intake layer 22 communicating with the intake passage 17.
Accordingly, the exhaust and intake airflows 14 and 15 exchanging the heats via the laminar 24 while passing the respective exhaust and intake layers 21 and 22.

FIG. 3 is a perspective view illustrating a laminar of a heat conduction unit according to an exemplary embodiment of the present invention. As shown in FIG. 3, the laminar 24 of the heat conduction unit 13 includes a high polymer resin layer 31 having high moisture permeability and air shield ability and a pair of fiber synthetic fabric layer 33a and 33b laminated on opposite surfaces of the high polymer resin layer 31. The outdoor air contained moisture is forced to flow into the inside through the intake passage 17 by the intake fan 11. The moisture contained in the intake airflow 15 is quickly absorbed by the fiber synthetic fabric layer 33a while passing the exhaust layer 21 of the heat conduction unit 13 and then transferred to the fiber synthetic fabric layer 33b via the high polymer resin layer 31. The moisture transferred to the fiber synthetic fabric layer 33b is taken by the exhaust airflow 14.

The high polymer resin layer 31 is characterized that one surface of which temperature is higher than that of the other surface has larger micro pores and micro channels than the other surface.

That is, the micro pores and channels on the surface of the high polymer resin layer 31 increase in proportion to the temperature in size such that the moisture can be transferred well from the high temperature airflow to the low temperature airflow.

The high polymer resin layer 31 is made of a temperature sensitive high polymer resin such that its micro pores and channels increase in proportion to the temperature in size, and the fiber synthetic fabric layers 33a and 33b are made by densely weaving a microfiber so as to have high water absorbancy and high moisture permeability.

FIG. 4 is a perspective view illustrating a laminar of a heat conduction unit according to another exemplary embodiment of the present invention. Unlike the laminar of FIG. 3, the laminar according to this embodiment is composed of a pair of high polymer resin layer 31a and 31b and a fiber synthetic fabric layer 33 interposed between the high polymer resin layer 31a and 31b.

The laminar 24 according to this embodiment is more effective than the laminar depicted in FIG. 3 in an environment less humid and requiring high air shield ability. This is because the high polymer resin layer 31a and 31b is superior to the fiber synthetic fabric layer 33 in moisture permeability and air shield ability.

Although the laminar 24 is composed of three layers in the embodiments depicted in FIGS. 3 and 4, it can be implemented with a signal high polymer resin layer and a single fiber synthetic fabric layer as a dual-layered laminar or implemented with one of the high polymer layer and the fiber synthetic fabric layer as a single-layered laminar.

In the case that the laminar 24 is implemented with a single high polymer resin layer having high moisture permeability, the laminar 24 is made to have furrows formed in a comb-pattern, pyramid-pattern, sinusoidal pattern, etc. for enlarging the surface area.

The high polymer resin layer 31 is made of material such as Teflon resin, urethane resin, and nylon resin, and may include a membrane made of polyamide or polysulfone. That is, the high polymer resin is made of at least one of polypropylene (PP), polyethylene (PE), polyester, polyvinyl chloride (PVC), polyurethane (PU), polyimide, polyamide, polysulfone, polysiloxane, polyethyleneterephthalate (PET), nylon, and Teflon.

The high polymer resin layer 31 is made of at least one of temperature sensitive high polymer resin layer of which micro pores and channels increase in proportion to the temperature, high moisture permeable high polymer resin layer, high moisture permeable and air shield ability polymer resin layer, and high thermal conductive high polymer resin layer.

The high polymer resin layer 31 can be implemented by coating material or laminating a thin film made of the material. The film or coated layer is made by diffusing at least one of micro copper molecules, aluminum molecules, carbon black molecules, carbon nano tube molecules, titanium dioxide (TiO2) molecules, and nano-silver molecules, to the raw material resin in the laminating or coating process.

In FIG. 4, the fiber synthetic fabric layer 33 of the laminar can be made by adding metal fiber 41 or metal-coated microfiber in a weaving process for improving the heat conductivity of the fiber synthetic fabric layer 33.

The advantageous effects of the metal fiber 41 can be replaced by diffusing at least one kind of micro copper molecules, aluminum molecules, carbon black molecules, carbon nano tube molecules, titanium dioxide (TiO2) molecules, and nano-silver molecules, to the micro fiber polymer. For example, the application of the nano silver molecules is proved that it improves the heat conductivity of the fabric layer and provides antibacterial and bactericidal effects.

Although exemplary embodiments of the present invention have been described in detail hereinabove, it should be clearly understood that many variations and/or modifications of the basic inventive concepts herein taught which may appear to those skilled in the present art will still fall within the spirit and scope of the present invention, as defined in the appended claims.

INDUSTRIAL APPLICABILITY

The heat conduction unit of the present invention can be applied to various heat exchangers.

1. A heat conduction unit comprising:
   a pair of exhaust and intake layers crossing each other for exchanging heat between exhaust and intake airflows;
   and
   a laminar interposed between the exhaust and intake layers and having a having a fiber synthetic fabric layer with a high water absorbancy and heat conductivity.

2. The heat conduction unit of claim 1, wherein the fiber synthetic fabric layer is made by densely weaving a microfiber in the form of a fabric, the fabric being woven by adding micro metal fiber, by adding microfiber plated with metal, or by adding at least ones of micro copper molecules, aluminum molecules, carbon black molecules, carbon nano tube molecules, titanium dioxide (TiO2) molecules, and nano-silver molecules, to a raw material resin of the microfiber.

3. A heat conduction unit having a pair of exhaust and intake layers crossing each other for exchanging heat between exhaust and intake airflows and laminar interposed between the exhaust and intake layers, wherein the laminar comprising:
   a fiber synthetic fabric layer having a high water absorbancy and high heat conductivity; and
   at least one higher polymer resin layer laminated or coated on at least one surface of the fiber synthetic fabric layer.
4. The heat conduction unit of claim 3, wherein the laminar is composed by forming the fiber synthetic fabric layer on one or both surfaces of the high polymer resin layer or by forming the high polymer resin layer on one or both surface of the fiber synthetic fabric layer.

5. The heat conduction unit of claim 4, wherein the high polymer resin layer is composed of at least one of temperature sensitive high polymer resin layer of which micro pores and channels increase in proportion to the temperature, high moisture permeable high polymer resin layer, high moisture permeable and air shield ability polymer resin layer, and high thermal conductive high polymer resin layer.

6. The heat conduction unit of claim 5, wherein the high polymer resin layer is made of at least one of polypropylene (PP), polyethylene (PE), polyester, polyvinyl chloride (PVC), polyurethane (PU), polyimide, polyamide, polysulfone, polysiloxane, polyethyleneterephthalate (PET), nylon, and Teflon.

7. The heat conduction unit of claim 5, wherein the high polymer resin layer is formed by doping at least ones of micro copper molecules, aluminum molecules, carbon black molecules, carbon nano tube molecules, titanium dioxide (TiO2) molecules, and nano silver molecules, to a raw material resin in the laminating or coating process.

8. A heat conduction unit comprising:

   - a pair of exhaust and intake layers crossing each other for exchanging heat between exhaust and intake airflows; and

   - a laminar interposed between the exhaust and intake layers and having a having a high polymer resin layer with a high moisture permeability,

   wherein the laminar has flat surfaces or at least one furrowed surface.

9. The heat conduction unit of claim 8, wherein the high polymer resin layer comprises at least one of temperature sensitive high polymer resin layer of which micro pores and channels increase in proportion to the temperature, high moisture permeable high polymer resin layer, high moisture permeable and air shield ability polymer resin layer, and high thermal conductive high polymer resin layer.

10. The heat conduction unit of claim 9, wherein the high polymer resin layer is made of at least one of polypropylene (PP), polyethylene (PE), polyester, polyvinyl chloride (PVC), polyurethane (PU), polyimide, polyamide, polysulfone, polysiloxane, polyethyleneterephthalate (PET), nylon, and Teflon.

11. The heat conduction unit of claim 9, wherein the high polymer resin layer is formed by doping at least ones of micro copper molecules, aluminum molecules, carbon black molecules, carbon nano tube molecules, titanium dioxide (TiO2) molecules, and nano silver molecules, to a raw material resin in the laminating or coating process.

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