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(54) **LOOP THERMOSYPHON COOLING DEVICE**

(71) Applicant: **Cooling House Co., Ltd.**, New Taipei City (TW)

(72) Inventors: **Torben Bjerrisgaard Lange**, New Taipei City (TW); **I-Ching WANG**, New Taipei City (TW)

(73) Assignee: **COOLING HOUSE CO., LTD.**, New Taipei City (TW)

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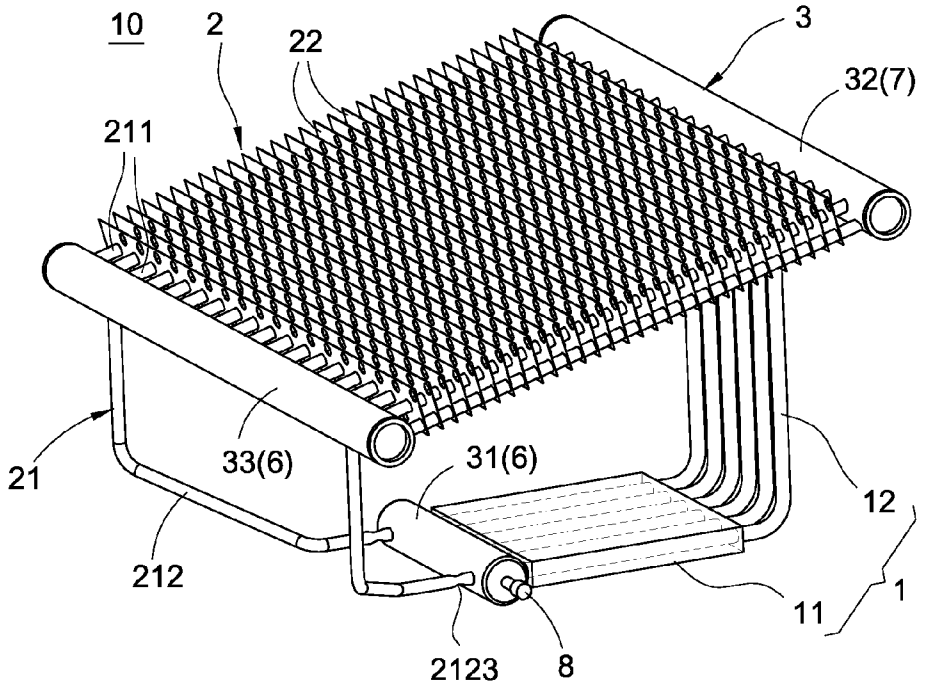
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(57) **ABSTRACT**

A loop thermosyphon cooling device includes an evaporator, a condenser and a communication assembly. The evaporator includes a heat conducting element and evaporation pipes, and the heat conducting element has through holes, and each evaporation pipe is passed and positioned into each respective through hole. The condenser includes a condensation pipe. The communication assembly includes a first barrel and a second barrel, and both ends of each evaporation pipe are communicated with the first and second barrels, and both ends of the condensation pipe are communicated with the first and second barrels, so that the evaporation pipe, condensation pipe, first barrel and second barrel jointly define a loop. A communication assembly is coupled between the evaporation pipe and the condensation pipe, and the quantity of evaporation pipes and condensation pipes can be increased or decreased as needed, and the thermosyphon cooling device is compact and high heat dissipation efficiency.



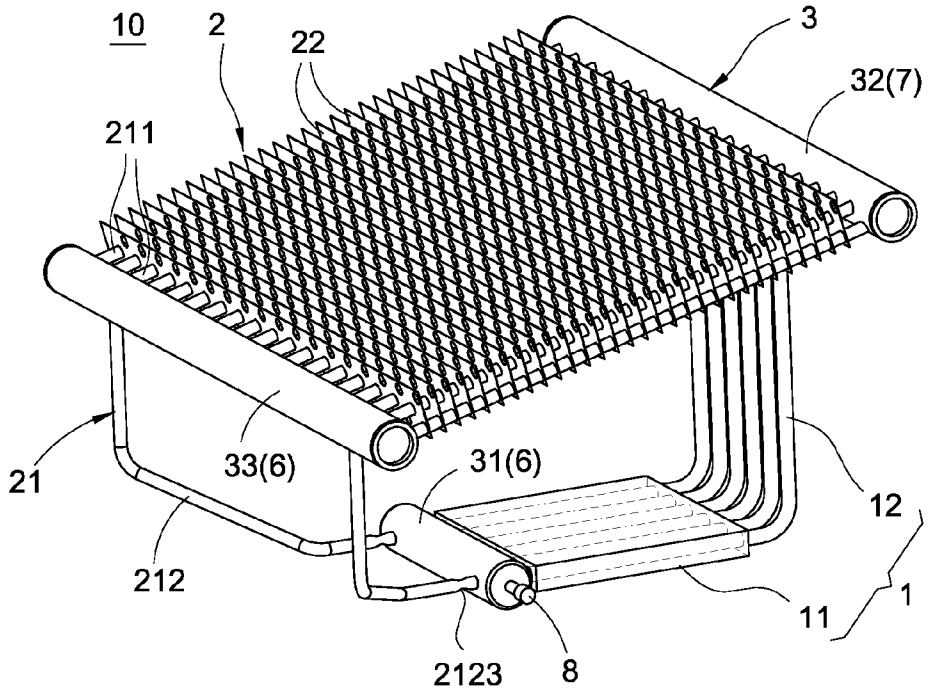

10
2
22
3
32(7)
211
21
33(6)
31(6)
12
212
11
1
2123
8

FIG.1

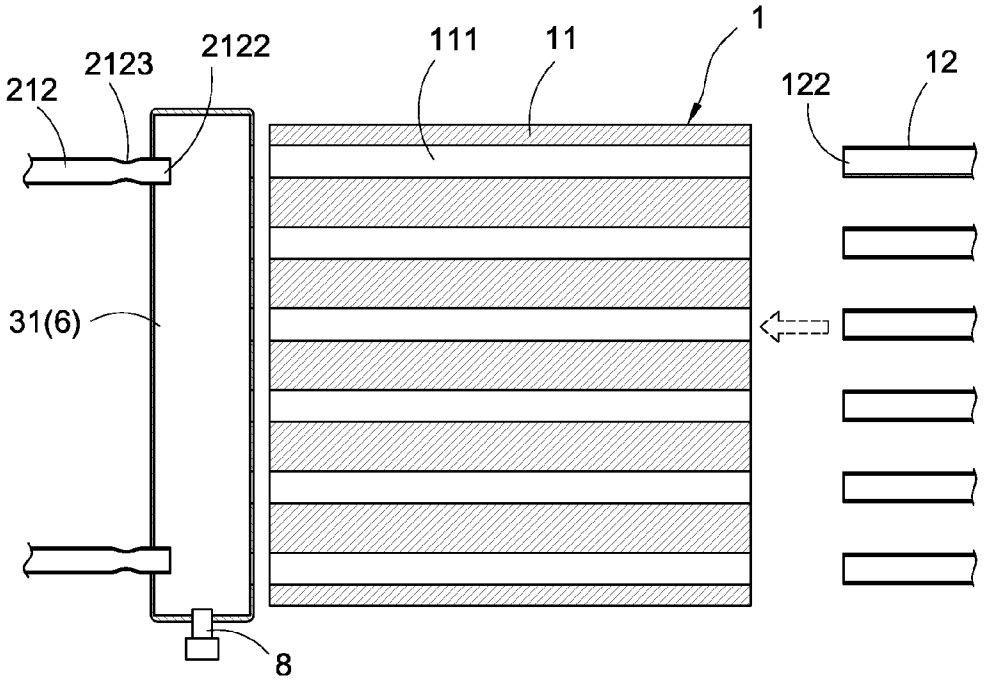

1
111
11
2123
2122
212
122
12
31(6)
8

FIG.2

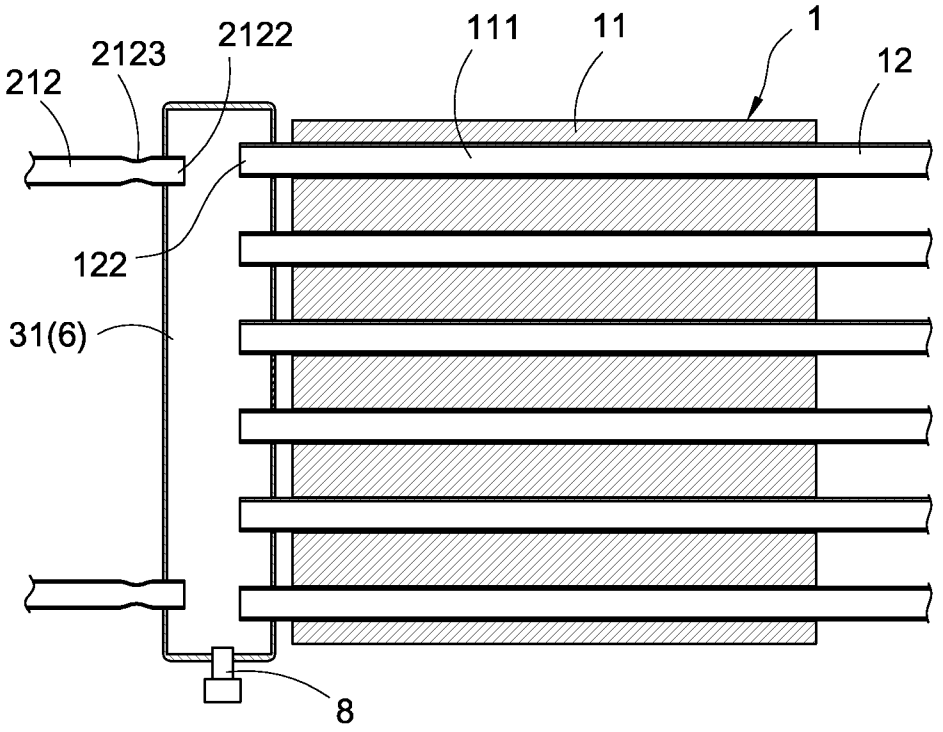


FIG.3

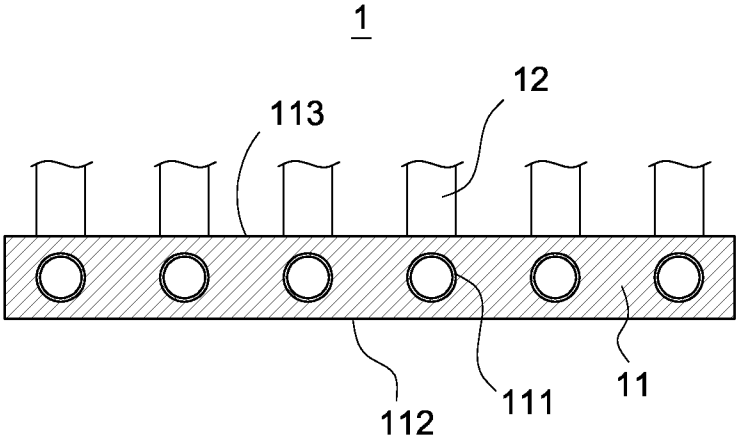


FIG.4

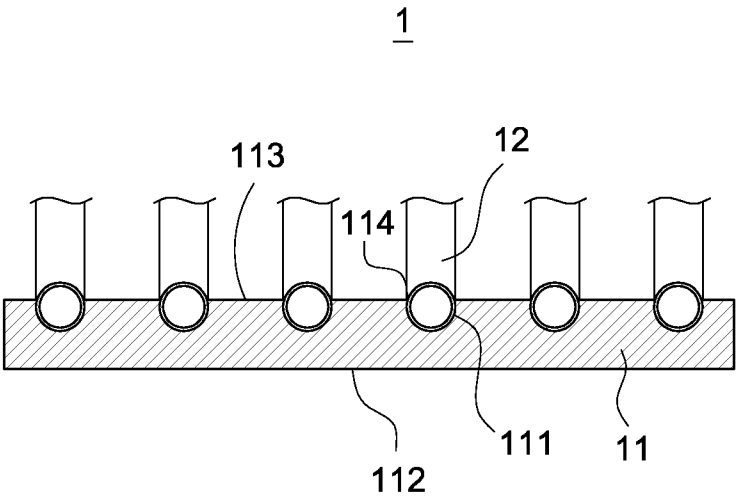


FIG.5

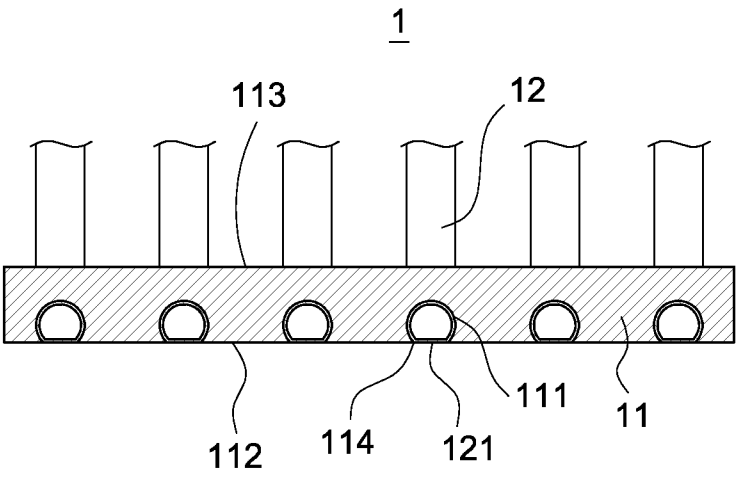


FIG.6

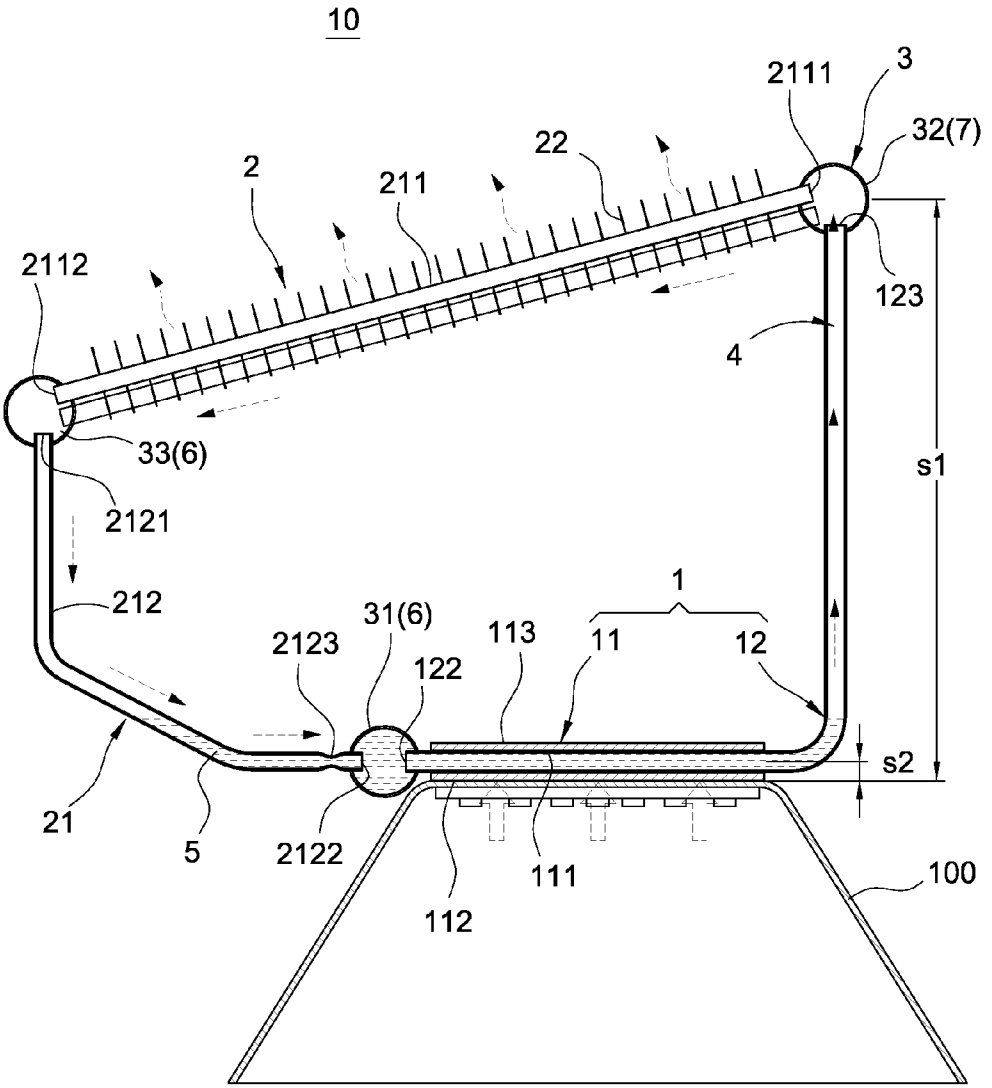

10
2111
3
32(7)
22
2
211
2112
123
4
33(6)
s1
2121
212
1
31(6)
2123
113
11
12
122
s2
21
5
2122
111
100
112

FIG.7

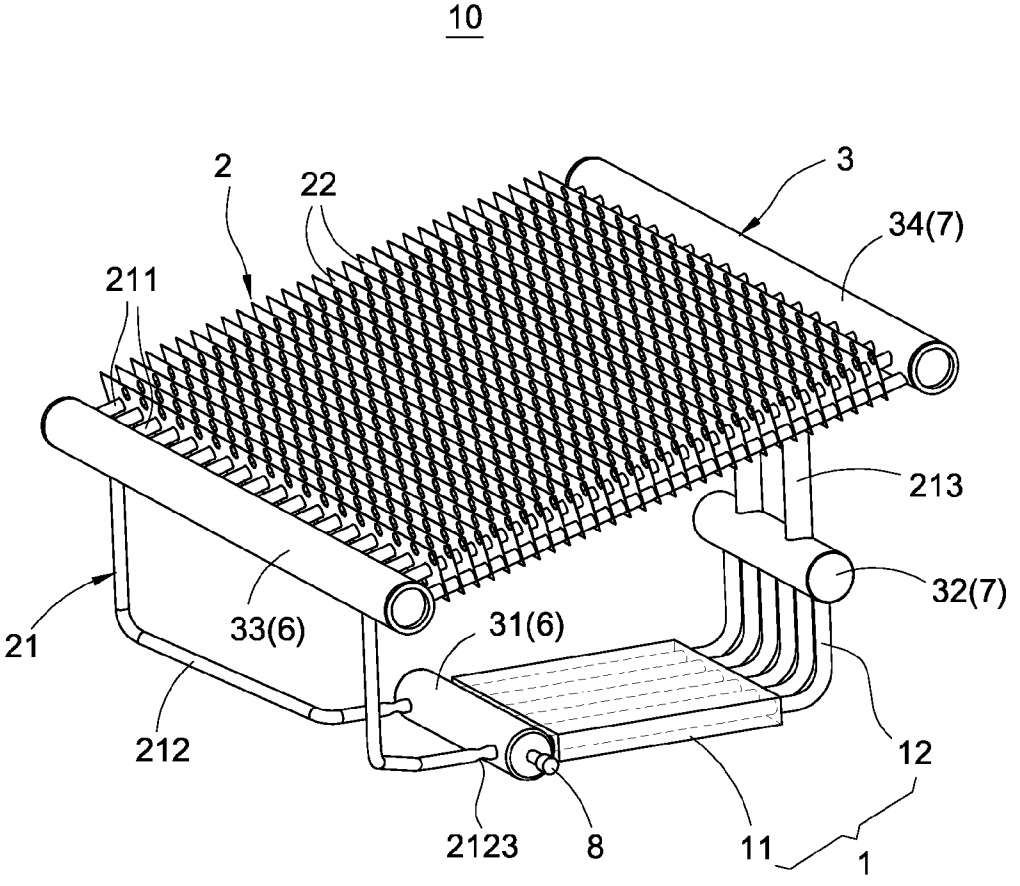


FIG.8

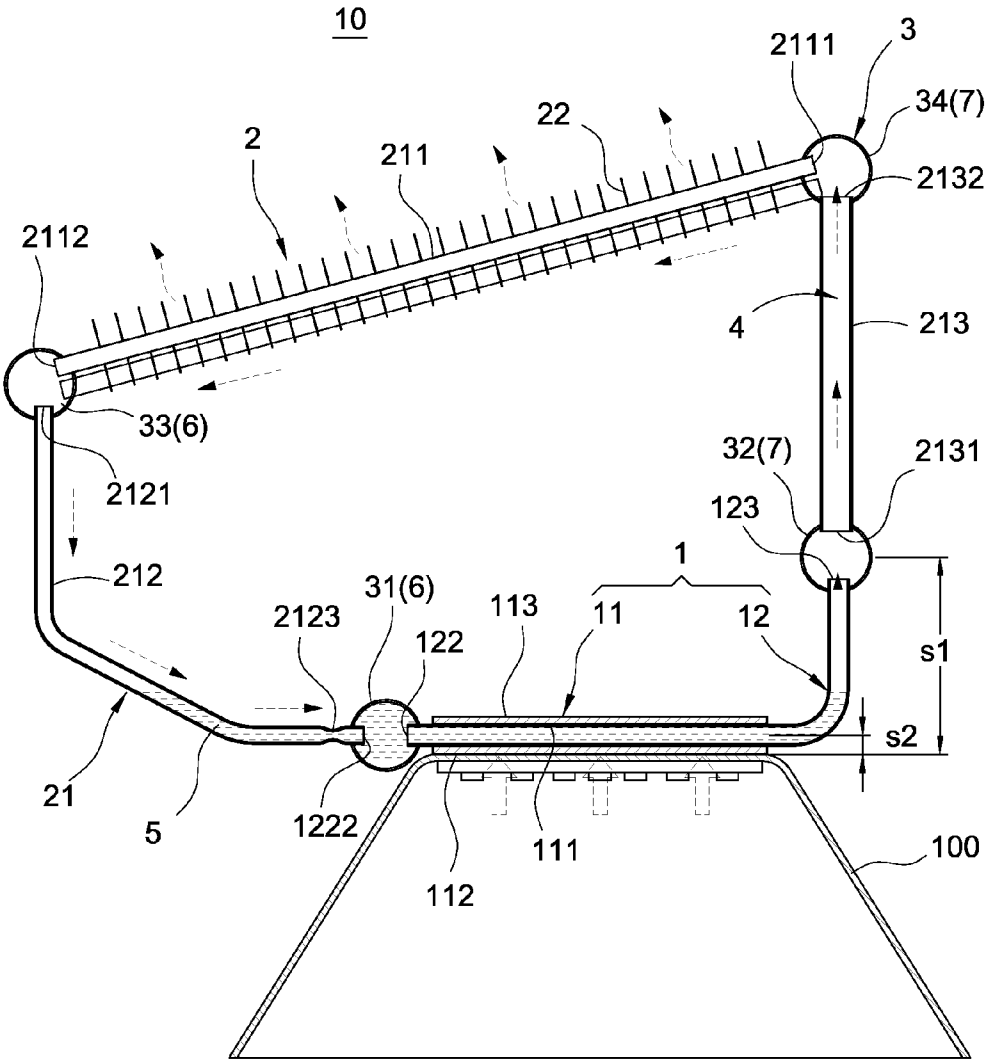

10
2111
3
34(7)
22
2
211
2132
2112
4
213
33(6)
32(7)
2131
2121
123
1
212
31(6)
113
11
12
2123
122
s1
s2
21
5
1222
111
100
112

FIG.9

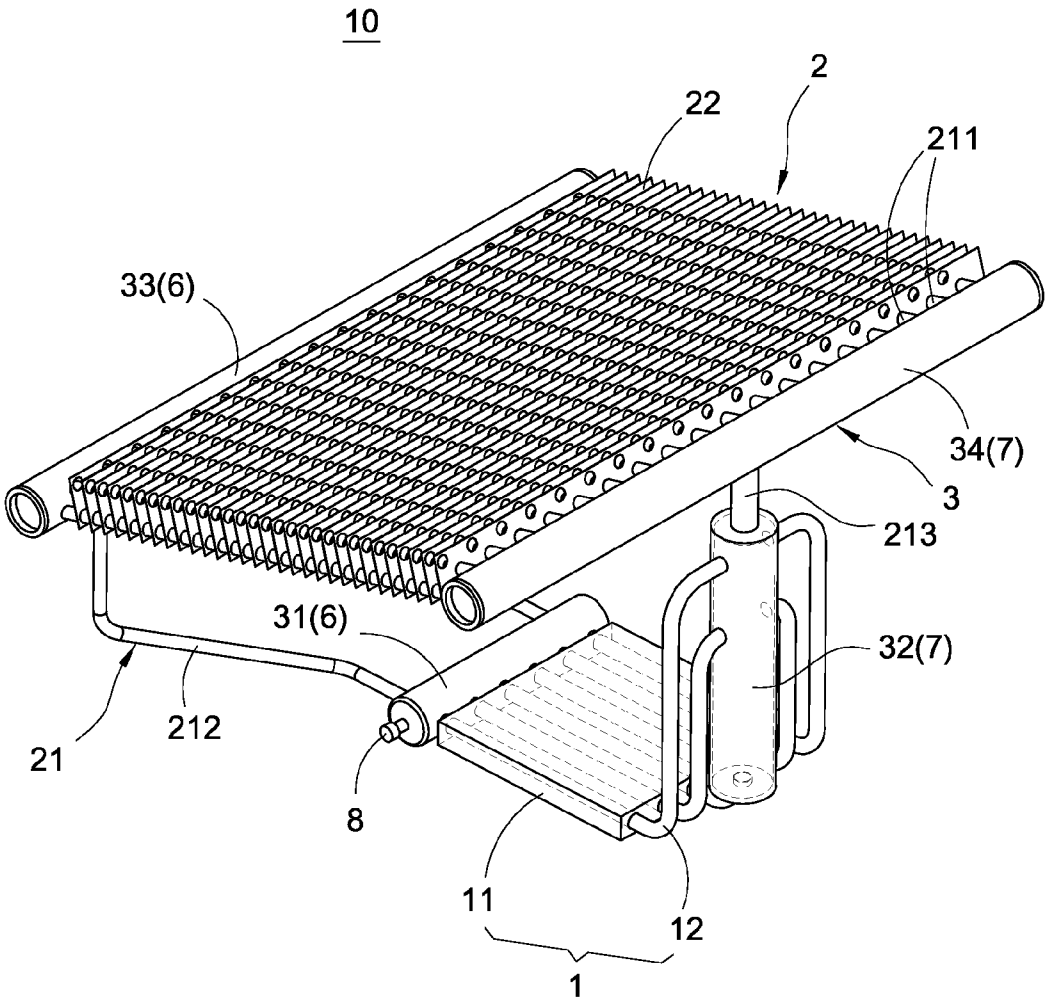


FIG.10

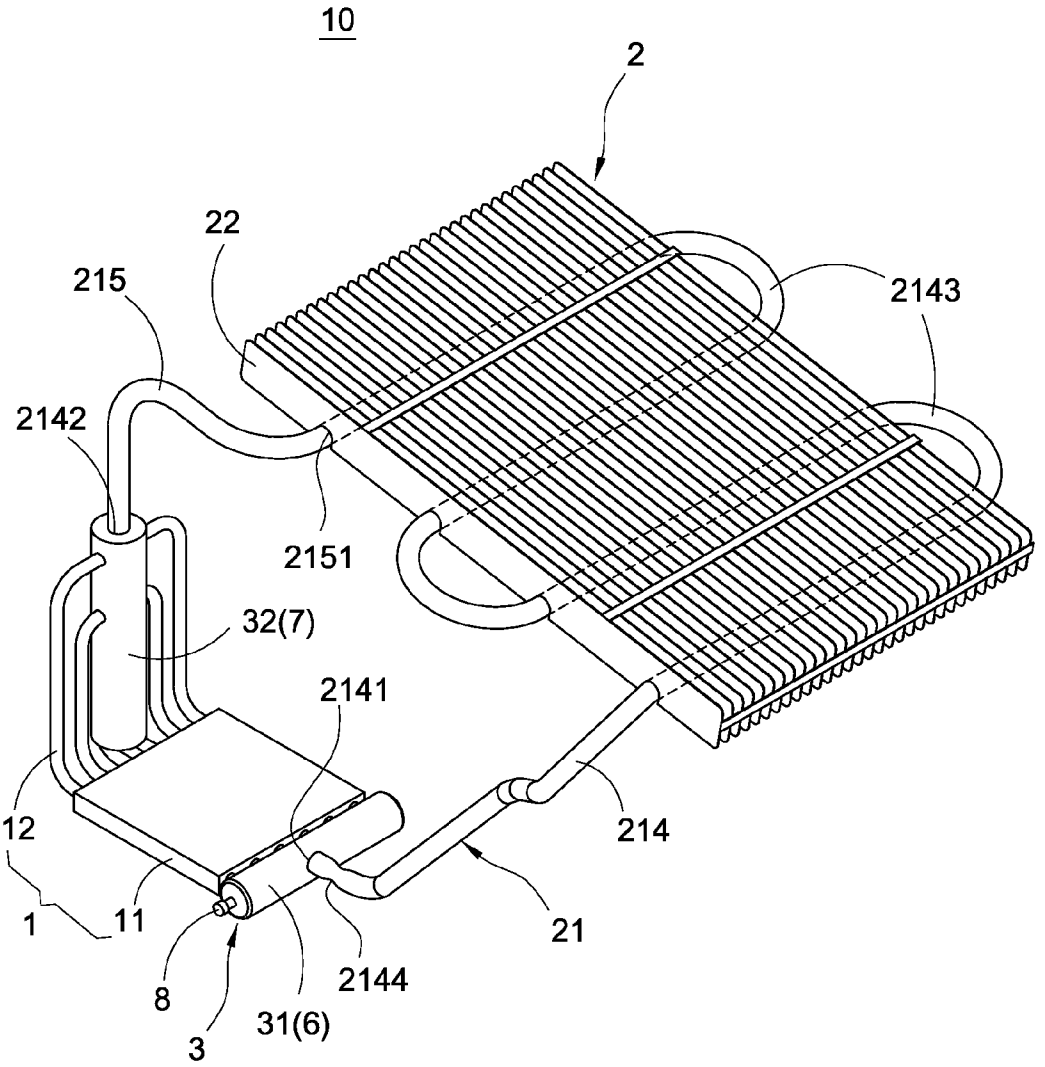


FIG.11

LOOP THERMOSYPHON COOLING DEVICE

FIELD OF THE INVENTION

[0001] The present invention relates to a cooling device, and more particularly to the loop thermosyphon cooling device.

BACKGROUND OF THE INVENTION

[0002] Cooling devices are used extensively in different places such as playgrounds, malls and factories where high bay lamps are installed and used as a main light source, and the light source of the high bay lamp is gradually replaced by low power consuming LEDs. However, LEDs will generate a large amount of heat, so that it is necessary to add a cooling device at the high bay lamp to assist the effect of dissipating the heat generated by the LEDs. In addition, places such as machine rooms having equipment like mainframe computers, servers or instruments installed therein may accumulate lots of heat after a long time of the operation, so that the cooling device is required to prevent the equipment from being damaged and achieve the heat dissipation effect.

[0003] A conventional "loop cooling device" as disclosed in Taiwan Pat. No. M256674 comprises a heat conducting element, a loop heat pipe and a working fluid, and the working fluid circulates in the loop heat pipe, and the loop heat pipe has an evaporation section and a condensation section, and the evaporation section is fixed to the heat conducting element, and the condensation section has fins or a fan installed thereon, so that the working fluid from the evaporation section carries away and dissipates the heat to the condensation section to achieve the heat dissipation effect.

[0004] However, the aforementioned loop cooling device has the following drawbacks: more loop heat pipes are generally required in the evaporation area and the condensation area for dissipating heat; and the loop heat pipe can be used only for guiding the flow in areas other than the evaporation area and the condensation area, so that less loop heat pipes are required in areas other than the evaporation area and the condensation area to reduce the total volume of the cooling device, but the loop heat pipe is a single pipe, and the quantity of loop heat pipes in each area is the same, and the loop cooling device cannot have both advantages of small volume and high heat dissipation efficiency.

[0005] In view of the aforementioned drawbacks, the inventor of the present invention based on years of experience in the related industry to conduct extensive researches and experiments to develop and design a loop thermosyphon cooling device in accordance with the invention to overcome the aforementioned drawbacks of the prior art.

SUMMARY OF THE INVENTION

[0006] Therefore, it is a primary objective of the present invention to provide a loop thermosyphon cooling device having a communication assembly coupled between the evaporation pipe and the condensation pipe, so that the quantity of evaporation pipes and condensation pipes can be increased or decreased as needed to achieve both advantages of small volume and high heat dissipation efficiency of the thermosyphon cooling device.

[0007] To achieve the aforementioned objective, the present invention provides a loop thermosyphon cooling device, comprising: an evaporator, including a heat conducting element and a plurality of evaporation pipes, and the heat conducting element having a plurality of through holes, and each evaporation pipe being passed and positioned into each corresponding through hole; a condenser, including a condensation pipe; and a communication assembly, including a first barrel and a second barrel, and both ends of each evaporation pipe being communicated with the first barrel and the second barrel respectively, and both ends of the condensation pipe being communicated with the first barrel and the second barrel respectively, so that each of the evaporation pipes, the condensation pipe, the first barrel and the second barrel jointly form a loop.

[0008] The present invention has the following advantages and effects:

[0009] 1. The evaporation pipe and the condensation pipe are connected by the communication assembly, so that it is not necessary to integrally form the evaporation pipe and the condensation pipe, and the quantity of evaporation pipes and condensation pipes can be increased or decreased according to actual needs to achieve the effects of compact size and high heat dissipation efficiency of the thermosyphon cooling device.

[0010] 2. The heat conducting element can have different numbers of through holes, and each evaporation pipe is passed and positioned in each respective through hole, so that the evaporation pipes can be arranged in parallel with one another to allow more evaporation pipes to be installed on the heat conducting element, so as to improve the heat dissipating effect of the thermosyphon cooling device of the present invention.

[0011] 3. The thermosyphon cooling device of the present invention further includes a working fluid circulated in a loop, and the loop is vacuumed, so that the working fluid can be dragged by pressure to flow and circulate in the loop, and the evaporator, condenser communication assembly and working fluid of the thermosyphon cooling device jointly dissipate heat to achieve an excellent heat dissipation efficiency.

[0012] 4. The first barrel is a liquid storage barrel capable of increasing the storage capacity of a liquid-state working fluid, so that the loop of the thermosyphon cooling device has a good buffering capability for a sudden increase of heat and can concentrate the convergent working fluid and divide the flow uniformly into each evaporation pipe, so as to stabilize the thermal conduction efficiency of each evaporation pipe.

[0013] 5. The second barrel is a gas storage barrel, and the gas storage barrel can increase the storage capacity of the gas-state working fluid and has a convergence effect, and the gas storage barrel is communicated with each of the evaporation pipes and condensation pipes, so that the quantity of condensation pipes is not necessary equal to the quantity of evaporation pipes, so that the quantity of condensation pipes can be decreased to achieve a compact size of the thermosyphon cooling device of the present invention.

[0014] 6. Both ends of each evaporation pipe are communicated with the first barrel and the second barrel respectively, and the heat conducting element has a heated surface, and the height difference between the second barrel and the heated surface is greater than the height difference between the first barrel and the heated surface, so that the position of the second barrel (which is the gas storage barrel) is higher than the position of the first barrel (which is the liquid storage barrel). The gas-state working fluid with a smaller specific gravity flows towards a high position, and the liquid-state working fluid with a greater specific gravity flows to a low position to stabilize the flow of the working fluid, so as to

accelerate the circulating and cooling speed of the thermosyphon cooling device and improve the heat dissipating effect of the thermosyphon cooling device.

[0015] 7. The quantity of condensation pipes can be increased as needed, and the communication assembly can have an increased quantity of barrels to fit the condensation pipes and adjust the volume and the heat dissipation efficiency of the thermosyphon cooling device.

[0016] 8. The condenser further includes a fin, and the condensation pipe at the position of fixing the fin is tilted gradually in a direction from an end portion where the gas-state working fluid is entered towards the heat conducting element, so that the gas-state working fluid can be cooled into a liquid state by the fin, and the liquid-state working fluid flows downward accordingly. In the meantime, the liquid-state working fluid has a greater specific gravity to accelerate the flow of the liquid-state working fluid, so that the working fluid can be refilled into the evaporation pipe quickly to stabilize the flow and improve the heat dissipation efficiency of the working fluid.

[0017] 9. The condensation pipe has a necking portion formed at a position adjacent to the first barrel, so that the internal diameter of the necking section can be smaller than the internal diameter of the evaporation pipe to prevent the working fluid in the evaporation pipe from flowing back into the condensation pipe and achieve a stable flow of the working fluid **5**.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] FIG. **1** is a perspective view of a loop thermosyphon cooling device of a first preferred embodiment of the present invention;

[0019] FIG. **2** is a schematic view of an evaporation pipe to be passed through a through hole of the present invention;

[0020] FIG. **3** is a schematic view of an evaporation pipe already passed through a through hole of the present invention;

[0021] FIG. **4** is a sectional view of a heat conducting element of the first preferred embodiment of the present invention;

[0022] FIG. **5** is a sectional view of a heat conducting element of a second preferred embodiment of the present invention;

[0023] FIG. **6** is a sectional view of a heat conducting element of a third preferred embodiment of the present invention;

[0024] FIG. **7** is a schematic view of a using status of a thermosyphon cooling device of the first preferred embodiment of the present invention;

[0025] FIG. **8** is a perspective view of a thermosyphon cooling device of the second preferred embodiment of the present invention;

[0026] FIG. **9** is a schematic view of a using status of a thermosyphon cooling device of the second preferred embodiment of the present invention;

[0027] FIG. **10** is a perspective view of a thermosyphon cooling device of the third preferred embodiment of the present invention; and

[0028] FIG. **11** is a perspective view of a thermosyphon cooling device of a fourth preferred embodiment of the present invention fourth.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0029] The technical contents of the present invention will become apparent with the detailed description of preferred embodiments accompanied with the illustration of related drawings as follows. It is noteworthy that the drawings are provided for the purpose of illustrating the present invention, but not intended for limiting the scope of the invention.

[0030] With reference to FIGS. **1** to **7** for a loop thermosyphon cooling device of the present invention, the thermosyphon cooling device **10** comprises an evaporator **1**, a condenser **2** and a communication assembly **3**.

[0031] The evaporator **1** includes a heat conducting element **11** and plurality of evaporation pipes **12**, and both ends of each evaporation pipe **12** have a liquid inlet end **122** and a gas outlet end **123** respectively. With reference to FIGS. **1** to **4** for a heat conducting element **11** of the first preferred embodiment of the present invention, the heat conducting element **11** has a plurality of through holes **111**, and each evaporation pipe **12** is passed and positioned in each through hole **111**.

[0032] With reference to FIG. **5** for a heat conducting element **11** of the second preferred embodiment of the present invention, the heat conducting element **11** has a heated surface **112** and a placing surface **113** disposed opposite to each other, and each through hole **111** has a through opening **114** formed on the placing surface **113**, and each evaporation pipe **12** is partially exposed from the placing surface **113** through each through opening **114**. With reference to FIG. **6** for the a heat conducting element **11** of the third preferred embodiment of the present invention, the heat conducting element **11** has a heated surface **112**, and each through hole **111** has a through opening **114** formed on the heated surface **112**, and each evaporation pipe **12** has a plane **121** exposed from each through opening **114**, and each plane **121** is pressed and aligned evenly with the heated surface **112**.

[0033] The condenser **2** includes a condensation pipe **21** and a plurality of fins **22**. Further, the condensation pipe **21** includes a plurality of first condensation pipes **211** and at least one second condensation pipe **212**, and both ends of each first condensation pipe **211** have a gas inlet end **2111** and a liquid outlet end **2112** respectively, and both ends of the second condensation pipe **212** have a liquid filling end **2121** and a liquid discharging end **2122** respectively, and each fin **22** is fixed to the first condensation pipes **211**, and each first condensation pipe **211** is tilted gradually from the gas inlet end **2111** to the liquid outlet end **2112** in a direction approaching the heat conducting element **11**.

[0034] The communication assembly **3** includes a first barrel **31** and a second barrel **32**, and both ends of each evaporation pipe **12** are communicated with the first barrel **31** and the second barrel **32** respectively, and both ends of the condensation pipe **21** are communicated with the first barrel **31** and the second barrel **32** respectively, and each evaporation pipe **12**, condensation pipe **21**, first barrel **31** and second barrel **32** jointly form a loop **4**. Specifically, the liquid inlet end **122** of each evaporation pipe **12** is communicated with the first barrel **31**, and each gas outlet end **123** is communicated with the second barrel **32**, and the heat conducting element **11** has a heated surface **112**, and the second barrel **32** and the heated surface **112** have a height difference s1 greater than the height difference s2 between the first barrel **31** and the heated surface **112**.

[0035] In addition, the communication assembly **3** includes a third barrel **33**, and the gas inlet end **2111** of each first condensation pipe **211** is communicated with the second barrel **32**, and each liquid outlet end **2112** is communicated with the third barrel **33**, and the liquid filling end **2121** of the second condensation pipe **212** is communicated with the third barrel **33**, and the liquid discharging end **2122** is communicated with the first barrel **31**. In addition, the second condensation pipe **212** has a necking portion **2123** formed at a position near the first barrel **31**.

[0036] The loop thermosyphon cooling device of the present invention further comprises a working fluid **5** circulating in the loop **4**, and the interior of the loop **4** is vacuumed, so that the working fluid **5** is dragged by pressure to flow in the loop **4**. In addition, the first barrel **31** is a liquid storage barrel **6**, the second barrel **32** is a gas storage barrel **7**, and the third barrel **33** is a liquid storage barrel **6**. Wherein, the working fluid **5** is water or a coolant.

[0037] In addition, the first barrel **31** or the second barrel **32** has a filling head **8** communicated with the loop **4**, and the filling head **8** is vacuumed, and then the working fluid **3** is filled into the loop **4**, such that the working fluid **3** is contained in the loop **4**.

[0038] In the assembly of the loop thermosyphon cooling device of the present invention, the evaporator **1** includes a heat conducting element **11** and each evaporation pipe **12**, and the heat conducting element **11** has each through hole **111** passed and positioned into each through hole **111**, and the condenser **2** includes a condensation pipe **21**. The communication assembly **3** includes a first barrel **31** and a second barrel **32**, and both ends of each evaporation pipe **12** are communicated with the first barrel **31** the and second barrel **32**, and both ends of the condensation pipe **21** are communicated with the first barrel **31** and the second barrel **32**, such that each evaporation pipe **12**, condensation pipe **21**, first barrel **31** and second barrel **32** jointly form a loop **4**. A communication assembly **3** coupled between the evaporation pipe **12** and the condensation pipe **21**, so that it is not necessary to have the evaporation pipe **12** and the condensation pipe **21** integrally formed with each other, and the quantity of evaporation pipes **12** and condensation pipes **21** can be increased or decreased as needed, so as to achieve the effect of a small volume and a high heat dissipation efficiency of the thermosyphon cooling device **10**.

[0039] In addition, the heat conducting element **11** has a plurality of through holes **111**, and each evaporation pipe **12** is passed and positioned into each through hole **111**, so that the evaporation pipes **12** are arranged almost parallel to one another, and more evaporation pipes **12** can be installed on the heat conducting element **11** to improve the heat dissipating effect of the thermosyphon cooling device **10** of the present invention.

[0040] With reference to FIG. **7** for a thermosyphon cooling device in accordance with the first preferred embodiment of the present invention, the heat generating element **100** is fixed onto the heated surface **112**, and the working fluid **5** is in a liquid state and flows from the first barrel **31** into each evaporation pipe **12**, and each evaporation pipe **12** receives the heat of the heat generating element **100**, so that the working fluid **5** is heated to become a gas-state. Further, the gas-state working fluid **5** enters into the second barrel **32** from each evaporation pipe **12**, and then enters into each first condensation pipe **211** from the second barrel **32**. Since the fins **22** are fixed to the first condensation pipes **211**, so that the heat of the gas-state working fluid **5** is dissipated through the fins **22** to form a liquid-state working fluid **5**. Finally, the liquid-state working fluid **5** flows from each first condensation pipe **211** into the third barrel **33**, and then enters into the first barrel **31** from the third barrel **33** through the second condensation pipe **212**, so as to define a loop **4**. The thermosyphon cooling device **10** of the present invention further comprises a working fluid **5** circulated in the loop **4**, and the interior of the loop **4** is vacuumed, and the working fluid **5** is dragged by pressure to flow in the loop **4**, so that the thermosyphon cooling device **10** can dissipate heat through the evaporator **1**, the condenser **2**, the communication assembly **3** and the working fluid **5** to achieve an excellent the heat dissipation efficiency of the thermosyphon cooling device **10** of the present invention.

[0041] In addition, the first barrel **31** is a liquid storage barrel **6** and capable of increasing the storage capacity of the liquid state working fluid **5** to provide a good buffer of the loop **4** of the thermosyphon cooling device **10** for a sudden increase of heat, while concentrating the working fluid **5** and flowing the working fluid **5** uniformly in each evaporation pipe **12** to stabilize the thermal conduction efficiency of each evaporation pipe **12**.

[0042] In addition, the second barrel **32** is a gas storage barrel **7** and capable of increasing the storage capacity of the gas-state working fluid **5** and has a convergence effect, and the gas storage barrel **7** is communicated with each of the evaporation pipes **12** and condensation pipes **21**, so that the number of condensation pipes **21** is not necessary to be equal to the number of evaporation pipes **12**, so that the number of condensation pipes **21** can be reduced to achieve the feature of a compact size of the thermosyphon cooling device **10**.

[0043] The liquid inlet end **122** of each evaporation pipe **12** is communicated with the first barrel **31**, and the gas outlet end **123** of each evaporation pipe **12** is communicated with the second barrel **32**, and the heat conducting element **11** has a heated surface **112**, and the height difference s1 between the second barrel **32** and the heated surface **112** is greater than the height difference s2 between the first barrel **31** and the heated surface **112**, so that the position of the second barrel **32** (which is the gas storage barrel **7**) is higher than the position of the first barrel **31** (which is the liquid storage barrel **6**), and the gas-state working fluid **5** with a smaller specific gravity flows to a high position, and the liquid-state working fluid **5** with a greater specific gravity enters from a low position to stabilize the flow of the working fluid **5**, so as to increase the circulating and cooling speed of the thermosyphon cooling device **10** and improve the heat dissipating effect of the thermosyphon cooling device.

[0044] In addition, the condensation pipe **21** includes a first condensation pipe **211** and a second condensation pipe **212**, and the communication assembly **3** further includes a third barrel **33**, and both ends of the first condensation pipe **211** are communicated with the second barrel **32** and the third barrel **33** respectively, and both ends of the second condensation pipe **212** are communicated with the third barrel **33** and the first barrel **31** respectively. Therefore, the quantity of condensation pipes **21** can be increased as needed, and the communication assembly **3** operated with the condensation pipe **21** can have an increased quantity of barrels to adjust the volume and the heat dissipation efficiency of the thermosyphon cooling device **10**.

[0045] The condenser **2** further includes a plurality of fins **22**, and each fin **22** is fixed to the first condensation pipe **211**,

and each first condensation pipe **211** is tilted from the gas inlet end **2111** to the liquid outlet end **2112** and gradually towards the heat conducting element **11**. In other words, the condensation pipe **21** at the position of fixing the fin **22** is tilted gradually from an end portion where the gas-state working fluid **5** is entered in a direction towards the heat conducting element **11**, so that the gas-state working fluid **5** can be cooled into a liquid state by the fin **22**, and the liquid-state working fluid **5** flows downward accordingly. In the meantime, the liquid-state working fluid **5** with a greater specific gravity accelerates the flow of the liquid- state working fluid **5** and is refilled into the evaporation pipe **12** quickly to stabilize the flow and improve the heat dissipation efficiency of the working fluid.

[0046] Finally, the second condensation pipe **212** has a necking portion **2123** formed at a position adjacent to the first barrel **31**. In other words, the condensation pipe **21** has necking portion **2123** adjacent to the first barrel **31**, so that the internal diameter of the necking section **2123** is smaller than the internal diameter of the evaporation pipe **12** to prevent the working fluid **5** in the evaporation pipe **12** from flowing back into the condensation pipe **21**, so as to achieve a stable flow of the working fluid **5**.

[0047] With reference to FIGS. **8** and **9** for a thermosyphon cooling device in accordance with the second preferred embodiment of the present invention, the communication assembly **3** further includes a fourth barrel **34**, and the condensation pipe **21** further includes at least one diversion assisting pipe **213**, and a gas filling end **2131** and a gas outlet end **2132** disposed at both ends of the diversion assisting pipe **213** respectively. The gas filling end **2131** of the diversion assisting pipe **213** is communicated with the second barrel **32**, the gas outlet end **2132** is communicated with the fourth barrel **34**, the gas inlet end **2111** of each first condensation pipe **211** is communicated with the fourth barrel **34**, each liquid outlet end **2112** is communicated with the third barrel **33**, the liquid filling end **2121** of the second condensation pipe **212** is communicated with the third barrel **33**, the liquid discharging end **2122** is communicated with the first barrel **31**, and the fourth barrel **34** is a gas storage barrel **7**. Therefore, the same effects and functions as described above can be achieved.

[0048] With reference to FIG. **10** for a thermosyphon cooling device in accordance with the third preferred embodiment of the present invention, the second barrel **32** can be an upright barrel or a horizontal barrel as shown in FIGS. **1** and **2**. Similarly, the first barrel **31**, the third barrel **33** or the fourth barrel **34** as shown in FIG. **1** or FIG. **8** can be an upright barrel or a horizontal barrel. In addition, the shape of the first barrel **31**, second barrel **32**, third barrel **33** or fourth barrel **34** includes but not limited to a circular shape, an oval shape or any geometric shape.

[0049] With reference to FIG. **11** for a thermosyphon cooling device in accordance with the fourth preferred embodiment of the present invention, the condensation pipe **21** includes a condensation pipe **214**, and a liquid guiding end **2141** and a gas guiding end **2142** disposed at both ends of the condensation pipe **214** respectively, wherein the liquid guiding end **2141** is communicated with the first barrel **31**, and the gas guiding end **2142** is communicated with the second barrel **32**. Therefore, the working fluid **5** can be circulated in the loop **4**, and the loop **4** is vacuumed, and the working fluid **5** is dragged by pressure to flow in the loop **4**, so that the thermosyphon cooling device **10** can dissipate heat jointly by the evaporator **1**, the condenser **2**, the communication assembly **3** and the working fluid **5**, so as to achieve the excellent heat dissipation efficiency of the thermosyphon cooling device **10** of the present invention.

[0050] In addition, the condensation pipe **214** has at least one U-shaped section **2143**, and each fin **22** is fixed to the U-shaped section **2143**, and the condensation pipe **214** has an extension **215** formed in a direction from the gas guiding end **2142** to a position away from the heat conducting element **11**, and the extension **215** has an end **2151**, and the condensation pipe **214** has a U-shaped section **2143** formed at the end **2151**, and the U-shaped section **2143** is tilted gradually in a direction from the end **2151** towards the heat conducting element **11**. In other words, the condensation pipe **21** has a position for fixing the fin **22**, and is tilted gradually from an end portion where the gas-state working fluid **5** is entered towards the heat conducting element **11**, so that the gas-state working fluid **5** can be cooled by the fin **22** into a liquid state, and the liquid-state working fluid **5** flows downward accordingly. Meanwhile, the liquid-state working fluid **5** has a greater specific ratio to accelerate the flow of the liquid-state working fluid **5**, so that the evaporation pipe **12** can be filled with the liquid-state working fluid **5** quickly to achieve a stable flow and a high heat dissipation efficiency of the working fluid **5**.

[0051] In addition, the condensation pipe **214** has a necking portion **2144** disposed at a position adjacent to the first barrel **31**. In other words, the condensation pipe **21** has a necking portion **2123** adjacent to the first barrel **31**, so that the necking section **2123** can have an internal diameter smaller than the internal diameter of the evaporation pipe **12** to prevent the working fluid **5** in the evaporation pipe **12** from flowing back into the condensation pipe **21**, so as to achieve a stable flow of the working fluid **5**.

[0052] In summation of the description above, the present invention achieves the expected objectives and overcomes the drawbacks of the prior art, and the invention complies with patent application requirements, and is thud duly filed for patent application.

[0053] While the invention has been described by means of specific embodiments, numerous modifications and variations could be made thereto by those skilled in the art without departing from the scope and spirit of the invention set forth in the claims.

What is claimed is:

1. A loop thermosyphon cooling device, comprising:

an evaporator, including a heat conducting element and a plurality of evaporation pipes, and the heat conducting element having a plurality of through holes, and each evaporation pipe being passed and positioned into each corresponding through hole;

a condenser, including a condensation pipe; and

a communication assembly, including a first barrel and a second barrel, and both ends of each evaporation pipe being communicated with the first barrel and the second barrel respectively, and both ends of the condensation pipe being communicated with the first barrel and the second barrel respectively, so that each of the evaporation pipes, the condensation pipe, the first barrel and the second barrel jointly form a loop.

2. The loop thermosyphon cooling device of claim **1**, wherein the heat conducting element has a heated surface and a placing surface opposite to each other, and each through hole has a through opening of the placing surface, and each

evaporation pipe is partially exposed from the placing surface through each through opening.

3. The loop thermosyphon cooling device of claim **1**, wherein the heat conducting element has a heated surface, and each through hole has a through opening formed on the heated surface, and each evaporation pipe has a plane exposed from each through opening, and each plane and the heated surface are aligned evenly with each other.

4. The loop thermosyphon cooling device of claim **1**, further comprising a working fluid circulating in the loop, and both ends of each evaporation pipe having a liquid inlet end and a gas outlet end respectively, and each liquid inlet end being communicated with the first barrel, and each gas outlet end being communicated with the second barrel, and the heat conducting element having a heated surface, and the second barrel and the heated surface having a height difference greater than the height difference between the first barrel and the heated surface, and the first barrel is a liquid storage barrel, and the second barrel is a gas storage barrel.

5. The loop thermosyphon cooling device of claim **4** wherein the working fluid is water or a coolant.

6. The loop thermosyphon cooling device of claim **4**, wherein the condenser further comprises a plurality of fins, and the communication assembly further comprises a third barrel, and the condensation pipe comprises a plurality of first condensation pipes and at least one second condensation pipe, and both ends of each first condensation pipe has a gas inlet end and a liquid outlet end, and both ends of the second condensation pipe have a liquid filling end and a liquid discharging end respectively, and each fin is fixed to the first condensation pipes, and each gas inlet end is communicated with the second barrel, and each liquid outlet end is communicated with the third barrel, and the liquid filling end is communicated with the third barrel, and the liquid discharging end is communicated with the first barrel, and the third barrel is a liquid storage barrel.

7. The loop thermosyphon cooling device of claim **6**, wherein each first condensation pipe is tilted gradually from the gas inlet end to the liquid outlet end in a direction of approaching the heat conducting element.

8. The loop thermosyphon cooling device of claim **6**, wherein the second condensation pipe has a necking portion formed at a position near the first barrel.

9. The loop thermosyphon cooling device of claim **4**, wherein the condenser further includes a plurality of fins, and the communication assembly further includes a third barrel and a fourth barrel, and the condensation pipe includes a plurality of first condensation pipes, at least one second condensation pipe and at least one diversion assisting pipe, and both ends of each first condensation pipe have a gas inlet end and a liquid outlet end respectively, and both ends of the second condensation pipe have a liquid filling end and a liquid discharging end respectively, and both ends of the diversion assisting pipe have a gas filling end and a gas outlet end respectively, and each fin is fixed to the first condensation pipes, and the gas filling end is communicated with the second barrel, and the gas outlet end is communicated with the fourth barrel, and each gas inlet end is communicated with the fourth barrel, and each liquid outlet end is communicated with the third barrel, and the liquid filling end is communicated with the third barrel, and the liquid discharging end is communicated with the first barrel, and the third barrel is a liquid storage barrel, and the fourth barrel is a gas storage barrel.

10. The loop thermosyphon cooling device of claim **9**, wherein each first condensation pipe is tilted gradually from the gas inlet end to the liquid outlet end in a direction approaching the heat conducting element.

11. The loop thermosyphon cooling device of claim **9**, wherein the second condensation pipe has a necking portion formed at a position near the first barrel.

12. The loop thermosyphon cooling device of claim **4**, wherein the condenser further includes a plurality of fins, and the condensation pipe includes a condensation pipe, and both ends of the condensation pipe have a liquid guiding end and a gas guiding end respectively, and the liquid guiding end is communicated with the first barrel, and the gas guiding end is communicated with the second barrel, and the condensation pipe has at least one U-shaped section bent from the condensation pipe, and the fins are fixed to the U-shaped section.

13. The loop thermosyphon cooling device of claim **12**, wherein the condensation pipe has an extension from at the gas guiding end and away from the heat conducting element, and the extension has an end, and the condensation pipe has the U-shaped section extended from the end, and the U-shaped section is tilted gradually from the end in a direction approaching the heat conducting element.

14. The loop thermosyphon cooling device of claim **12**, wherein the condensation pipe has a necking portion formed at a position near the first barrel.

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