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(54) **Heat-dissipating device**

(57) A heat-dissipating device includes a hollow housing adapted to contact a heat source (3, 3') and for receiving a heat-conducting fluid (12) therein, a heat-conducting member (22) contacting the heat-conducting fluid (12), and a heat-dissipating fin unit driven to move within an ambient fluid so as to dissipate heat from the fin unit to the ambient fluid.

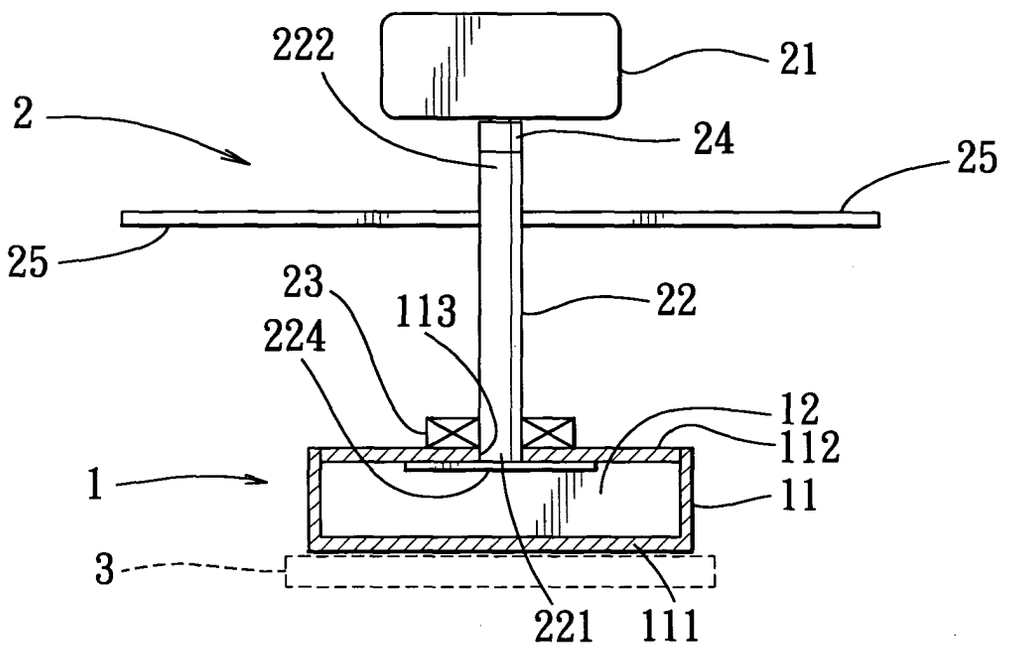

FIG. 1

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Description

[0001] This invention relates to a heat-dissipating device, and more particularly to a heat-dissipating device that includes heat-dissipating fins which can be driven to move within an ambient fluid so as to promote the heat dissipation efficiency of the device.

[0002] A conventional heat-dissipating device normally includes a heat-conducting member contacting a heat source, a plurality of heat-dissipating fins fixed on the heat-conducting member so as to dissipate heat from the heat-conducting member to an ambient fluid, such as air, and a fan for blowing air toward the fins. According to the wind chill effect, when the speed of air current flowing from the fan onto the fins increases by 100 meters per second, the surface temperature of the fins will reduce by only about 1°C in view of a limited relative speed between air and the fins. As such, when the heat source has a comparatively high temperature, there is a need for a fan of a larger size to create a faster air current, thereby increasing the volume and manufacturing costs of the conventional heat-dissipating device.

[0003] The object of this invention is to provide a heat-dissipating device that includes a plurality of heat-dissipating fins, which can be driven to move within an ambient fluid so as to increase significantly the relative speed between the ambient fluid and the fins, thereby promoting the heat dissipation efficiency of the device.

[0004] According to this invention, a heat-dissipating device includes a hollow housing adapted to contact a heat source and for receiving a heat-conducting fluid therein, a heat-conducting member contacting the heat-conducting fluid, and a heat-dissipating fin unit driven to move within an ambient fluid, such as air, so as to dissipate heat from the fin unit to the ambient fluid. As such, a relatively high relative speed between the ambient fluid and the heat-dissipating fin unit can be obtained so as to enhance the wind chill effect, thereby increasing the heat dissipation efficiency significantly.

[0005] These and other features and advantages of this invention will become apparent in the following detailed description of the preferred embodiments of this invention, with reference to the accompanying drawings, in which:

Fig. 1 is a schematic sectional view of the first preferred embodiment of a heat-dissipating device according to this invention;

Fig. 2 is a schematic sectional view of the second preferred embodiment of a heat-dissipating device according to this invention;

Fig. 3 is a schematic top view of two heat-dissipating fins of the second preferred embodiment;

Fig. 4 is a schematic sectional view of the third preferred embodiment of a heat-dissipating device according to this invention; and

Fig. 5 is a schematic view of the fourth preferred embodiment of a heat-dissipating device according to this invention.

[0006] Before the present invention is described in greater detail in connection with the preferred embodiments, it should be noted that similar elements and structures are designated by like reference numerals throughout the entire disclosure.

[0007] Referring to Fig. 1, the first preferred embodiment of a heat-dissipating device according to this invention is shown to include a heat-absorbing mechanism 1 and a heat-dissipating mechanism 2.

[0008] The heat-absorbing mechanism 1 includes a hollow primary housing 11 that is made of a heat-conducting material and that is adapted to contact a first heat source 3, such as a CPU chip, so as to permit heat transfer from the first heat source 3 to the primary housing 11, and a heat-conducting fluid 12 that is received within the primary housing 11 so as to permit heat transfer from the primary housing 11 to the heat-conducting fluid 12. The primary housing 11 has a contacting wall 111 that contacts the first heat source 3, and a mounting wall 112 that is parallel to the contacting wall 111 and that is formed with a circular hole 113 therethrough. The heat-conducting fluid 12 may be gas, liquid, or a coolant.

[0009] The heat-dissipating mechanism 2 includes a driving unit 21, a heat-conducting member 22, a bearing unit 23, a connector 24, and a heat-dissipating fin unit consisting of two heat-dissipating fins 25. The driving unit 21 is configured as an electrical motor. The heat-conducting member 22 is configured as a motor shaft that is rotated by the driving unit 21 and that has a first end 221 and a second end 222. The first end 221 is journalled on the primary housing 11 by means of the bearing unit 23, and extends into the primary housing 11 through the circular hole 113 in the mounting wall 112 of the primary housing 11. The second end 222 is connected to the driving unit 21 by means of the connector 24. The fins 25 are connected fixedly to and extend radially and outwardly from the second end 222 of the heat-conducting member 22. An outward flange 224 is formed on the first end 221 of the heat-conducting member 22, is disposed in the primary housing 11 so as to contact the heat-conducting fluid 12, thereby permitting heat transfer from the heat-conducting fluid 12 to the heat-conducting member 22, and has a diameter that is larger than that of the circular hole 113 in the primary housing 11 so as to prevent removal of the heat-conducting member 22 from the primary housing 11. The fins 25 are exposed within an ambient fluid, i.e. air. As such, when the driving unit 21 runs, the fins 25 rotate about the heat-conducting member 22 at a relatively high speed relative to the ambient fluid so as to enhance the wind chill effect, thereby permitting rapid heat transfer from the fins 25 to the ambient fluid. Alternatively, the fins 25 can be driven to perform reciprocating linear movement, swinging movement, or any other similar motion relative to the first heat source 3.

[0010] Figs. 2 and 3 show the second preferred em-

bodiment of a heat-dissipating device according to this invention, which is similar to the first preferred embodiment in construction. Unlike the first preferred embodiment, the heat-conducting member 22 is hollow, and is formed with a central bore 220, and the heat-dissipating mechanism 2 further includes two tubes 26 that are connected respectively and fixedly to the fins 25. The central bore 220 has an open end 221 in fluid communication with an interior chamber 110 in the primary housing 11, and a closed end 222 proximate to the driving unit 21. Each of the tubes 26 extends along a spiral path on the corresponding fin 25, and has a closed outer end 261, and an open inner end 262 in fluid communication with the central bore 220 in the heat-conducting member 22.

[0011] Fig. 4 shows the third preferred embodiment of a heat-dissipating device according to this invention, which is similar to the second preferred embodiment in construction. Unlike the second preferred embodiment, no tubes 26 are provided, and each of the fins 25 is hollow, and is formed with an interior space 250 that has a closed radial outer end 251 and an open radial inner end 252 that is in fluid communication with the central bore 220 in the heat-conducting member 22.

[0012] Fig. 5 shows the fourth preferred embodiment of a heat-dissipating device according to this invention, which is similar to the third preferred embodiment in construction. Unlike the third preferred embodiment, the heat-absorbing mechanism 1 further includes a hollow secondary housing 13 that is adapted to contact a second heat source 3' so as to permit heat transfer from the second heat source 3' to the secondary housing 13, and a conduit 14 that is connected removably to and that is in fluid communication with the primary and secondary housings 11, 13. The first and second heat sources 3, 3' constitute a heat source unit.

[0013] The heat-dissipating fin unit may comprise a single fin, or a plurality of fins.

Claims

1. A heat-dissipating device for dissipating heat from a heat source unit (3, 3') to an ambient fluid, said heat-dissipating device being **characterized by**:

   a heat-absorbing mechanism (1) including a hollow primary housing (11) that is made of a heat-conducting material and that is adapted to contact the heat source unit (3, 3') so as to permit heat transfer from the heat source unit (3, 3') to said primary housing (11), and a heat-conducting fluid (12) that is received within said primary housing (11) so as to permit heat transfer from said primary housing (11) to said heat-conducting fluid (12); and

   a heat-dissipating mechanism (2) including

   a heat-conducting member (22) that contacts said heat-conducting fluid (12) so as to permit heat transfer from said heat-conducting fluid (12) to said heat-conducting member (22),

   a heat-dissipating fin unit that is mounted to said heat-conducting member (22) so as to permit heat transfer from said heat-conducting member (22) to said heat-dissipating fin unit and that is adapted to be exposed within the ambient fluid so as to permit heat transfer from said dissipating fin unit to the ambient fluid, and

   a driving unit (21) connected to said heat-dissipating fin unit so as to drive said heat-dissipating fin unit to move within the ambient fluid.

2. The heat-dissipating device as claimed in claim 1, **characterised in that** said driving unit (21) is configured as an electrical motor, said heat-conducting member (22) being configured as a motor shaft that is rotated by said electrical motor, said heat-dissipating fin unit including one or more fins (25) that are connected fixedly to and that extend radially and outwardly from said motor shaft so that said electrical motor can rotate said one or more fins (25) about said motor shaft.

3. The heat-dissipating device as claimed in claim 2, further **characterised in that** said primary housing (11) has an interior chamber (110) for receiving said heat-conducting fluid (12) therein, said motor shaft being hollow and being formed with a central bore (220) that has a closed end proximate to said electrical motor, and an open end in fluid communication with said interior chamber (110) in said primary housing (11).

4. The heat-dissipating device as claimed in claim 3, wherein said heat-dissipating mechanism (2) further includes one or more tubes (26) that are connected respectively and fixedly to said one or more fins (25), each of said tubes (26) having a closed outer end (261), and an open inner end (262) in fluid communication with said central bore (220) in said motor shaft.

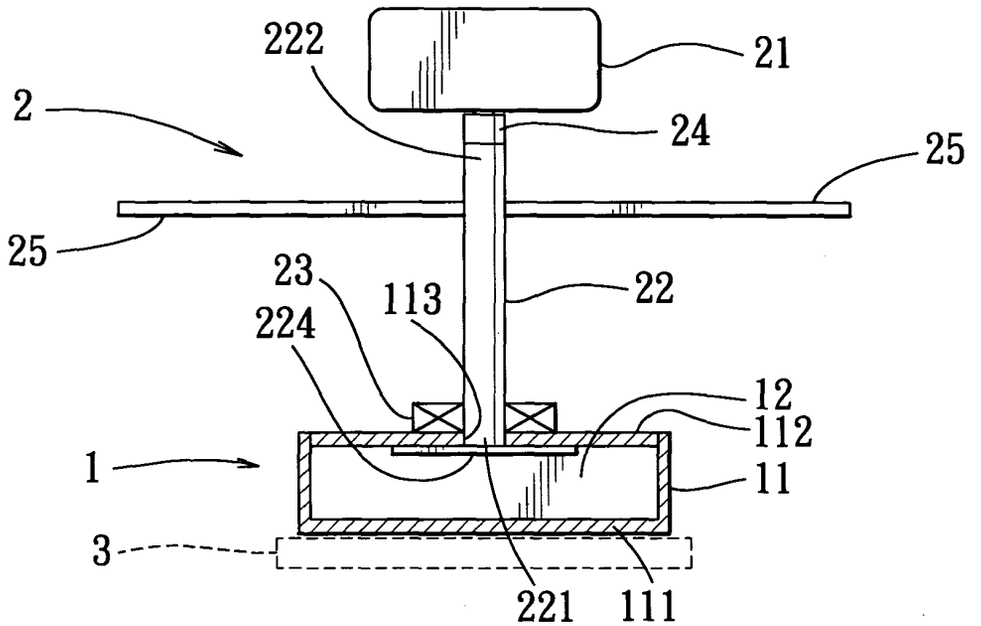
5. The heat-dissipating device a claimed in claim 4, further **characterised in that** each of said tubes (26) extends along a spiral path on a respective one of said one of more fins (25).

6. The heat-dissipating device as claimed in claim 3, further **characterised in that** each of said one or more fins (25) is hollow, and is formed with an interior space (250) that has a closed radial outer end (251) and an open radial inner end (252), which is

in fluid communication with said central bore (220) in said motor shaft.

7. The heat-dissipating device as claimed in claim 6, further **characterised in that** said heat-absorbing mechanism (1) further includes a hollow secondary housing (13) that is adapted to contact the heat source unit (3, 3') so as to permit heat transfer from the heat source unit (3, 3') to said secondary housing (13), and a conduit (14) that is connected removably to and that is in fluid communication with said primary and secondary housings (11, 13).

8. The heat-dissipating device as claimed in claim 2, further **characterised in that** said heat-dissipating mechanism (2) further includes a bearing unit (23), said motor shaft being journalled on said primary housing (11) by means of said bearing unit (23), said primary housing (11) having a contacting wall (111) that is adapted to contact the heat source unit (3, 3'), and a mounting wall (112) that is parallel to said contacting wall (111) and that is formed with a circular hole (113), said motor shaft extending into said primary housing (11) through said circular hole (113) and being formed with an outward flange (224) that is disposed in said primary housing (11) and that has a diameter larger than that of said circular hole (113) in said primary housing (11) so as to prevent removal of said motor shaft from said primary housing (11).


222
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111

FIG. 1

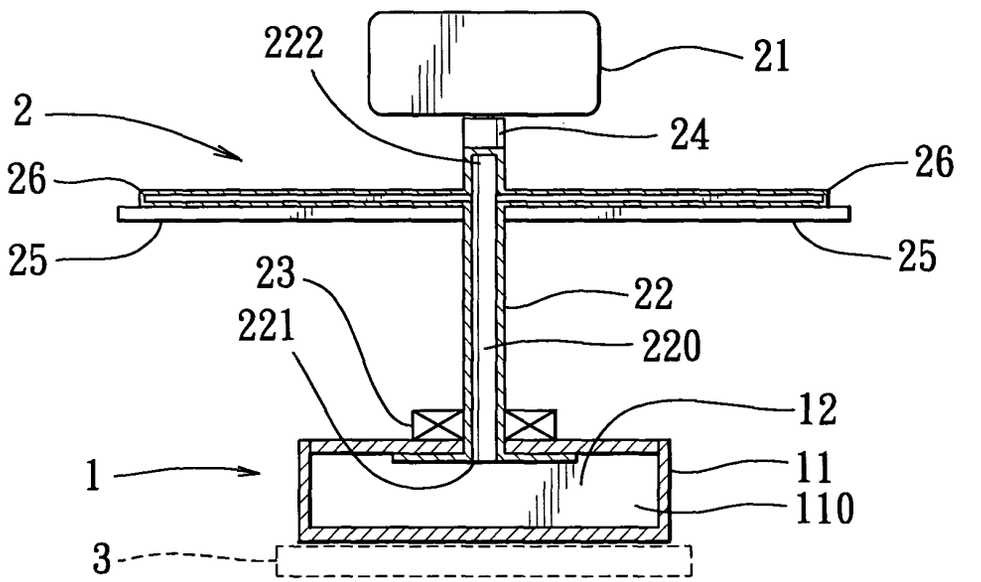
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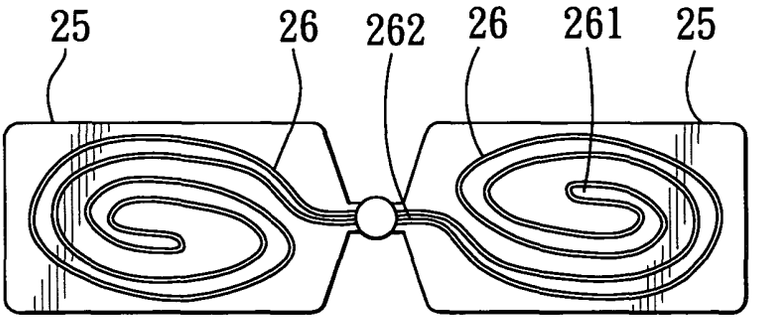
FIG. 2


25
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262
26
261
25

FIG.3

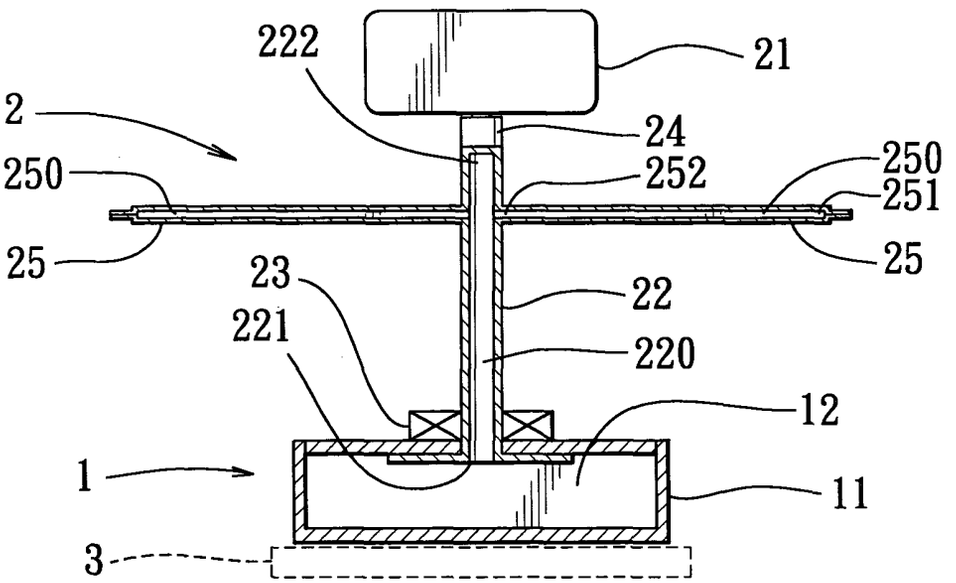
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FIG.4

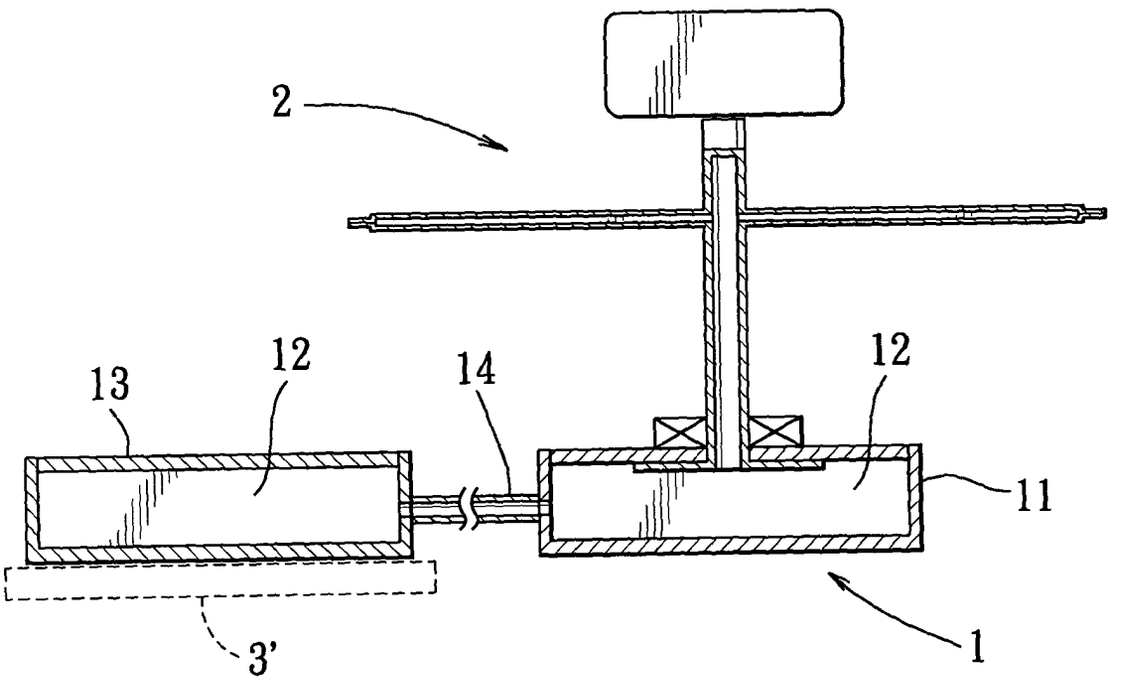

FIG.5

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EUROPEAN SEARCH REPORT

Application Number
EP 03 25 4436

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	9 December 2003	Van Dooren, M

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