

HEAT RADIATION STRUCTURE OF CLOSED TYPE DEVICE ✓

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a heat radiation structure for a closed type device for use in the open air.

2. Description of the Related Art

As a heat radiation structure for a closed type device for use in the open air, a cooler structure of the heat pipe type has been adopted, in which heat pipes having heat collecting fins are provided in a casing of the heat radiation structure and heat pipes having heat radiation fins are provided outside the casing of the structure. For example, in Japanese Patent Publication No. 59-43115, a cabinet for an electronic device, which keeps temperatures in the device approximately constant using a heat pipe, is disclosed. FIG. 1A is a front view of the heat radiation structure, FIG. 1B is a section view taken along the line III-III of FIG. 1A, and FIG. 1C is a section view taken along the line II-II of FIG. 1A. In this prior art, three heat pipes 5, each operating at different temperatures, are provided in the upper zone of a casing 1. Heat collecting fins 4 are mounted to the portions of the heat pipes 5 located inside the

casing 1 and heat radiation fins 4a are mounted to the portions thereof located outside the casing 1. The heat pipes 5 are integrally assembled beforehand to the heat collecting fins 4, heat radiation fins 4a, heat insulating material 1a and mounting plate 7 to constitute a heat pipe assembly body. The assembly body is fixed to the casing 1 in the following manner. The assembly body is inserted into the casing 1 through a hole formed in the upper part of the assembly body so as to correspond to the shape of the heat insulating material 1a, and the mounting plate 7 is fixed to the casing 1 by means of screw. Then, a gap around the hole is filled with suitable resin to fix the assembly body to the casing 1. Further, a sunshade 6 is provided outside the assembly body. Such heat radiation structure of the closed cabinet type for radio equipment has been used.

In the prior art as described above, since the heat pipe is disposed across the casing, there is a problem that a relatively large space is required to mount the assembly body and hence the size of the closed type device becomes larger. Furthermore, since expensive heat pipe coolers are used and many constituent parts are used, construction man-hours increase, resulting in increased cost.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a heat radiation structure of a device for use in the open air at low cost, without using heat pipe coolers, in which no mounting space is required and the size of device can be reduced, and heating structures can be easily manufactured and the number of parts can be reduced.

Another object of the present invention is to provide, in a closed device in which an upper and lower casings are combined to provide watertightness, a heat radiation structure, in which a plurality of through holes are formed in the upper and lower casings and a sheet having therein many fine holes is mounted to the upper and lower casings, respectively, so as to cover all of the through holes.

Still another object of the present invention is to provide a heat radiation structure for a closed type device, in which a plurality of through holes having a predetermined size can be formed in the upper and lower casings at predetermined intervals and a sheet is formed of a network having a large number of meshes.

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention and the advantages thereof, reference is now

made to the following description taken in conjunction with the accompanying drawings, in which;

FIG. 1A is a front section view of a conventional heat radiation structure;

FIG. 1B is a section view taken along the line III-III of FIG. 1A;

FIG. 1C is a section view taken along the line II-II of FIG. 1A;

FIG. 2A is a plan view showing an embodiment of a heat radiation structure of the present invention;

FIG. 2B is a side view of the embodiment of the heat radiation structure of the present invention;

FIG. 2C is a partial section view taken along the line A-A of FIG. 2A; and

FIG. 3 is a partial plan view showing a sheet of the heat radiation structure of the present invention.

Detailed Description of the Preferred Embodiments

Next, an embodiment of the present invention will be described with reference to the accompanying drawings. FIGS. 2A, 2B and 2C show a heat radiation structure of a closed type device of the present invention. FIG. 2A is a plan view, and FIG. 2B is a side view. FIG. 2C and FIG. 2B are a partial section view, and FIG. 3 shows a sheet in detail.

As shown in FIGS. 2A and 2B, the heat radiation structure of the present invention consists of an upper

casing 11, a lower casing 12 and a sheet 13 for heat radiation. The foregoing upper casing 11 is provided with a plurality of through holes 14 having a predetermined size d at predetermined intervals, to dissipate the heat inside the heat radiation structure.

As shown in FIG. 2C, the lower casing 12 has the same structure and a plurality of through holes 14 are formed therein. The foregoing sheet 13 is formed of a thin material having water resistance property and air permeability. As shown in FIG. 3, the sheet 13 is provided with a plurality of fine holes 13a and has a structure such that heat inside the casings is allowed to radiate through the holes 13a, but water and dusts coming from the outside are prevented from getting into the casings. Sizes of the fine holes should preferably be 1 to 10 microns, and the fine holes serve to prevent the invasion of water drops but allow vapor to freely pass therethrough, where, sizes of water drops, that is rain, are generally about 2000 microns and sizes of vapor are about 0.001 microns. An adhesive tape 13b, having a width w , is adhered to the periphery of the sheet 13 to attach the sheet 13 integrally to the inner surfaces of the casings 11 and 12 so as not to cover the holes 14. To attach the sheet 13 to the upper casing 11, the sheet 13 is attached to the inside surface of the upper casing 11 using the adhesive tape

13b so that all the holes 14 are covered with the sheet 13. In the case of the lower casing 12, the same process as described above can be taken. By combining the upper casing 11 with the lower casing 12, a closed type device can be obtained, so that invasion of water and dusts can be prevented and heat in the device can be freely released to the outside.

As described above, since the plurality of through holes are provided in the top and bottom plates of the upper and lower casings, heat generated in the device can be radiated to the outside. In addition, since the sheet 13 having the plurality of fine through holes 13b is attached to the inside surface of the upper and lower casings 11 and 12 so as to cover all of the through holes 14, watertightness required for an outdoor device can be obtained and invasion of dusts can be prevented. Since the sheet has air permeability, heat radiation effect within the casings can be maintained.

The through holes are formed in the upper and lower casings and the sheet having a plurality of fine holes is adhesively attached to the inside surfaces thereof, and hence heat radiation effect can be obtained without using heat pipes. Therefore, an inexpensive heat radiation structure able to achieve miniaturization and simplicity of the device as well as

reduction of the number of parts can be provided, and the structure can be easily assembled.

Although the preferred embodiment of the present invention has been described in detail, it should be understood that various changes, substitutions and alteration can be made therein without departing from spirit and scope of the invention as defined by the appended claims.



WHAT IS CLAIMED IS:

1. A heat radiation structure for a closed type device which keeps watertightness by combining an upper casing with a lower casing, wherein a plurality of through holes are formed in said upper and lower casings, respectively, and sheets having a plurality of fine holes are attached to said upper and lower casings, respectively, so as to cover all of said through holes.

2. The heat radiation structure for the closed type equipment according to claim 1, wherein said through holes has a predetermined size and are formed at predetermined intervals.

3. The heat radiation structure for the closed type equipment according to claim 1, wherein said sheet is formed of a network body having a large number of fine meshes.