In a method of forming bent heat dissipating unit, the following steps are included: putting a plurality of radiating fins on and around a straight heat pipe to form a heat dissipating unit; engaging the heat dissipating unit with a forming die assembly, so that a plurality of locating die units sequentially arranged on a carrier of the assembly are separately positioned in a space between two adjacent radiating fins; pressing the engaged heat dissipating unit and forming die assembly against a forming block; and driving a processing machine connected to the carrier of the forming die assembly to change the arrangement of the locating die units and thereby bend the heat dissipating unit to a shape corresponding to a profile of the forming block. An apparatus for forming the bent heat dissipating unit through the above steps is also provided.
FIG. 4
METHOD OF FORMING BENT HEAT DISSIPATING UNIT AND APPARATUS THEREFOR

FIELD OF THE INVENTION

[0001] The present invention relates to a method and apparatus for forming bent heat dissipating unit for use on a computer and/or communication related product, and more particularly to a method and apparatus for forming a bent heat pipe with a plurality of radiating fins equally spaced thereon in an easy and economical manner.

BACKGROUND OF THE INVENTION

[0002] To enable efficient and effective dissipation of heat transmitted to a heat pipe forming a radiating device, the heat pipe is conventionally divided into three portions, namely, a heat dissipating end, a heat transmitting section, and a heat source connecting end. Normally, the heat pipe is subjected to particular machining to form these three portions. The heat source connecting end is connected to a heat source, so that heat is transmitted from the heat source via the heat source connecting end to the heat transmitting section and the heat dissipating end, at which point is dissipated using a cooling fan. The heat dissipating end of the heat pipe may be differently shaped, such as in a circular form, a semicircular form, etc., to increase a dissipating area thereof.

[0003] The heat pipe may be made of copper, aluminum, or other metal materials. In the heat pipe, there is contained a highly heat-conducting liquid or pure water, or a special type of metal, such as yttrium, barium, etc., or other materials with super-high heat conductivity. When the highly heat-conducting material contained in the heat pipe is heated, the molecules thereof are caused to oscillate at high speed and rub with one another, so as to extremely quickly transmit heat in a wavelike motion. That is why the heat pipe has a heat transmission rate much higher than general radiating fins, and is also referred to as the super heat pipe.

[0004] FIGS. 1 and 2 show a conventional way of forming a curved dissipating heat pipe for a radiating device. To increase the dissipating area, a heat pipe 11 is first bent to a curved shape, and a plurality of radiating fins 12 are then assembled to the curved heat pipe 11 one by one. Since the radiating fins 12 must be manually assembled to the curved heat pipe 11 one by one, the curved heat pipe 11 could not be mass-produced and requires very high labor cost. In the event the radiating fins 12 are mounted on the curved heat pipe 11 by way of tight fitting, an extended mounting time is required. On the other hand, if the radiating fins 12 are mounted on the curved heat pipe 11 by way of loose fitting, the radiating fins 12 must be further soldered to the heat pipe 11 to increase the labor and material costs of the heat pipe 11.

[0005] It is therefore tried by the inventor to develop a method and apparatus for forming bent heat dissipating unit to eliminate the drawbacks existed in the conventional way of forming a curved heat pipe.

SUMMARY OF THE INVENTION

[0006] A primary object of the present invention is to provide a method and apparatus for forming bent heat dissipating unit, with which a plurality of radiating fins could be easily equally spaced on a bent heat pipe.

[0007] Another object of the present invention is to provide a method and apparatus for forming bent heat dissipating unit, with which a heat dissipating unit can be mechanically bent to different shapes to provide an enhanced heat dissipating effect and an increased flexibility in the use of the heat dissipating unit.

[0008] Another object of the present invention is to provide a method and apparatus for forming bent heat dissipating unit, which can be easily implemented or operated to shorten the time needed to bend a heat dissipating unit.

[0009] Another object of the present invention is to provide a method and apparatus for forming bent heat dissipating unit, with which deformation of the heat pipe and radiating fins in the process of bending the heat dissipating unit is minimized.

[0010] Another object of the present invention is to provide a method and apparatus for forming bent heat dissipating unit, with which the cost for processing the heat dissipating unit is reduced.

[0011] Another object of the present invention is to provide a heat dissipating unit that would not unnecessarily occupy too much space.

[0012] To achieve the above and other objects, an apparatus for forming bent heat dissipating unit according to the present invention includes a forming die assembly, a forming block, and an oil press. And, a method of forming bent heat dissipating pipe according to the present invention includes the following steps: putting a plurality of radiating fins on and around a straight heat pipe to form a heat dissipating unit; engaging the heat dissipating unit with a forming die assembly, so that a plurality of locating die units sequentially arranged on a carrier of the assembly are separately positioned in a space between two adjacent radiating fins; pressing the heat dissipating unit and the forming die assembly against a forming block; and driving an oil machine connected to the carrier of the forming die assembly to change the arrangement of the locating die units and thereby bend the heat dissipating unit to a shape corresponding to a profile of the forming block.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The structure and the technical means adopted by the present invention to achieve the above and other objects can be best understood by referring to the following detailed description of the preferred embodiments and the accompanying drawings, wherein

[0014] FIG. 1 shows a conventional manner of mounting radiating fins on a curved heat pipe to increase the dissipating area of the heat pipe;

[0015] FIG. 2 shows the heat pipe of FIG. 1 with radiating fins mounted thereon;

[0016] FIG. 3 schematically shows a heat dissipating unit prior to bending using the method and apparatus of the present invention;

[0017] FIG. 4 schematically shows the heat dissipating unit of FIG. 3 having been bent using the method and apparatus of the present invention; and
FIG. 5 schematically shows the bending of a heat dissipating unit to an S-shape using the method and apparatus of the present invention.

**DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Please refer to FIGS. 3 and 4 that show the bending of a heat dissipating unit using a method and apparatus according to a preferred embodiment of the present invention. As shown, the apparatus for bending a heat dissipating unit 21 according to the preferred embodiment of the present invention includes a forming die assembly 22, a forming block 23, and a processing machine 24.

The heat dissipating unit 21 includes a heat pipe 211, which is originally a straight pipe, and a plurality of radiating fins 212 sequentially put on and around the straight heat pipe 211.

The forming die assembly 22 includes a plurality of locating die units 221 and a carrier 222. The locating die units 221 are sequentially connected to one another using the carrier 222, so that the locating die units 221 are arranged side by side on the carrier 222. It is noted any two adjacent locating die units 221 on the carrier 222 are pivotally connected at an end to each other via a pivot 223, so that the forming die assembly 22 consisting of a series of pivotally connected locating die units 221 on the carrier 222 can be actively curved to facilitate bending or curving of the heat dissipating unit 21, as will be described hereinafter. All the locating die units 221 are identical in size, and are therefore useful in equally spacing the radiating fins 212 on the heat pipe 211. When it is desired to increase or decrease the space between any two adjacent radiating fins 212, simply change the size of the locating die units 221.

When the locating die units 221 of the forming die assembly are sequentially located in a space between two adjacent radiating fins 212 on the heat pipe 211, the heat dissipating unit 21 with the forming die assembly 22 engaged therewith is pressed and bent against an outer surface of the forming block 23, so as to have a shape corresponding to a profile of the forming block 23. It is appreciable that the number of the forming blocks 23 may be increased depending on actual need in processing the heat dissipating unit 21. A variety of heat dissipating units 21 with changeable shapes may be produced through thoughtful designs and proper adjustment and allocation of the forming blocks 23, so as to achieve enhanced heat dissipating and radiating effect, and to have the heat dissipating unit 21 an increased flexibility in the use thereof.

The processing machine 24, which is an oil press in the illustrated embodiment, is connected to the carrier 222 of the forming die assembly for changing a manner in which the locating die units 221 is arranged on the carrier 222.

In a method of the present invention for bending the heat dissipating unit 21, the following steps are included:

(a) sequentially putting a plurality of radiating fins 212 on and around a straight heat pipe 211 to form a heat dissipating unit 21;

(b) separately positioning a plurality of locating die units 221 arranged on a carrier of a forming die assembly into a space between two adjacent radiating fins 212 on the heat pipe 211, so as to engage the forming die assembly with the heat dissipating unit;

(c) extending two ends of the carrier 222 of the forming die assembly 22 through the forming block 23 to connect them to the processing machine 24, that is, the oil press; and

(d) driving the processing machine 24 to press the forming die assembly 22 against the forming block 23, so that the heat dissipating unit 21 engaged with the forming die assembly is bent to have a shape corresponding to a profile of the forming block 23.

Please refer to FIG. 5 that shows the bending of a heat dissipating unit using a method and apparatus according to another embodiment of the present invention. In this embodiment, a first and a second forming block 23, 25 are included to bend the heat dissipating unit 21 into an S-shape. To ensure good connection of the carrier 222 to the processing machine 24 to complete the S-shaped bending, the carrier 222 is particularly extended through two guide rollers 261, 262 provided at predetermined points between the forming blocks 23, 25 and the processing machine 24, which is also an oil press in this embodiment.

In the present invention, it is also possible to provide an oil press 24 on each forming block 23, 25, so that the forming block 23, 25 could be independently driven to bend the heat dissipating unit 21 in the process of forming a bent heat dissipating unit 21.

The present invention is superior to the prior art for the following advantages and effects:

1. The radiating fins can be more easily put on the straight heat pipe to constitute a heat dissipating unit, and the heat dissipating unit could then be bent into a desired shape through simplified procedures using the forming block and the processing machine.

2. It is not necessary to manually mount the radiating fins on the heat pipe one by one. Different processing machines could be employed at different stages to assemble, bend, and shape the heat dissipating unit, allowing the bent heat dissipating units to be mass-produced.

3. In the method of the present invention, when the radiating fins on the heat pipe of the heat dissipating unit are pressed against the forming block through an action of the forming die assembly, since the radiating fins are very closely spaced on the heat pipe, they are not subjected to any undesirable deformation due to a normal acting force applied by the forming die assembly toward the center of circle of the forming block. To the contrary, the closely spaced radiating fins on the heat pipe facilitate the bending of the heat dissipating unit.

The present invention has been described with some preferred embodiments thereof and it is understood that many changes and modifications in the described embodiments can be carried out without departing from the scope and the spirit of the invention that is intended to be limited only by the appended claims.
What is claimed is:

1. A method of forming bent heat dissipating unit, comprising the steps of:
   
   (a) sequentially putting a plurality of radiating fins on and around a straight heat pipe to form a heat dissipating unit;
   
   (b) separately positioning a plurality of locating die units of a forming die assembly into a space between two adjacent ones of said radiating fins on said heat pipe; wherein said locating die units are sequentially arranged side by side on a carrier of said forming die assembly, and any two adjacent ones of said locating die units are pivotally connected at an end to each other via a pivot;
   
   (c) extending two ends of said carrier of said forming die assembly through a forming block to connect to a processing machine; and
   
   (d) driving said processing machine to press said forming die assembly against said forming block, so that said heat dissipating unit located between said forming die assembly and said forming block is bent to a shape corresponding to a profile of said forming block.

2. An apparatus for forming bent heat dissipating unit, comprising:

   a heat dissipating unit formed from a straight heat pipe and a plurality of radiating fins put on and around said heat pipe,

   a forming die assembly including a carrier, and a plurality of locating die units sequentially arranged side by side on said carrier; and any two adjacent ones of said locating die unit being pivotally connected to each other via a pivot;

   a first forming block, against which said heat dissipating unit with said locating die units of said forming die assembly separately positioned between two adjacent ones of said radiating fins is pressed to form a shape corresponding to a profile of said first forming block; and

   a processing machine being connected to two ends of said carrier of said forming die assembly for changing a manner in which said locating die units are arranged on said carrier.

3. The apparatus for forming bent heat dissipating unit as claimed in claim 2, wherein said processing machine comprises an oil press.

4. The apparatus for forming bent heat dissipating unit as claimed in claim 2, wherein said first forming block is provided with an oil press for independently driving said first forming block to bend said heat dissipating unit in the process of forming a bent heat dissipating unit.

5. The apparatus for forming bent heat dissipating unit as claimed in claim 2, further comprising a second forming block for cooperating with said first forming block to bend said heat dissipating unit to an S-shape.

6. The apparatus for forming bent heat dissipating unit as claimed in claim 5, wherein said second forming block is provided with an oil press for independently driving said second forming block to bend said heat dissipating unit in the process of forming a bent heat dissipating unit.

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