

HEAT DISSIPATION APPARATUS

[0001] This application claims priority to the Chinese patent application filed with the China Patent Office on May 17, 2023, with the application number 202321181996.1, and the invention name “HEAT DISSIPATION APPARATUS,” the entire content of which is incorporated into the present application by reference.

TECHNICAL FIELD

[0002] The present application relates to the technical field of components that facilitate cooling, and more particularly to a heat dissipation apparatus.

BACKGROUND ART

[0003] Chinese patent publication number CN114269106A discloses a heat dissipation apparatus, and the heat dissipation apparatus includes: a bracket assembly, a heat dissipator, and a fastening assembly. A first surface of the heat dissipator has a heat conductive protrusion, two side surfaces of the heat dissipator have guide grooves, and an extending direction the guide grooves is inclined toward the first surface along an insertion direction of a heat source device. The fastening assembly includes a connector and a clamping member. The clamping member is disposed on two sides of the bracket assembly. One end of the connector is slidably mounted on the guide groove on a same side, and another end of the connector abuts against the clamping member on the same side.

[0004] In the existing technology, the fastening assembly on the two sides of the heat dissipator form a transmission mating structure with the heat dissipator, such that the heat dissipator moves closer to the heat source device as the heat

source device moves, and finally the heat conductive protrusion is in thermal conduction contact with the heat source device.

SUMMARY OF THE INVENTION

[0005] The embodiments of the present application provide a heat dissipation apparatus having a simplified structure.

[0006] In order to solve the above technical problems, the embodiments of the present application disclose technical solutions as follows:

[0007] In one aspect, a heat dissipation apparatus is provided, and the heat dissipation apparatus is used to dissipate heat from an optical module. The heat dissipation apparatus includes a housing, a heat dissipation member, and a guide member.

[0008] The housing has an accommodating cavity and a first opening and a second opening communicating with the accommodating cavity. The first opening and the second opening are respectively located on two adjacent sides of the accommodating cavity, and the optical module is inserted into the accommodating cavity through the first opening; the heat dissipation member is slidably disposed at the second opening, the heat dissipation member includes a base, a heat dissipation part, a first mating part, and a driving part. The base is movably disposed on a side of the housing having the second opening, the heat dissipation part and the first mating part are both disposed on a side of the base facing away from the housing, and the driving part protrudes from a surface of the base facing the housing; the guide member includes a main body and a second mating part, the main body is connected to the housing, the second mating part is connected to the main body and located on the side of the base facing away from the housing, and the first mating part is located between the second mating part

and the housing; at least one of the first mating part and the second mating part has an inclined surface, and the inclined surface extends along a moving direction of inserting the optical module into the accommodating cavity and extends toward the accommodating cavity; when the optical module is inserted into the accommodating cavity, the optical module drives the heat dissipation member to move synchronously through the driving part, and the first mating part and the second mating part cooperate to guide the heat dissipation member to move toward the accommodating cavity, so that the heat dissipation member is in thermal conduction contact with the optical module.

[0009] In addition to or as an alternative to one or more features disclosed above, the heat dissipation member further includes a third mating part, and the third mating part is arranged on a side of the base facing the housing; the housing further has a fourth mating part; at least one of the third mating part and the fourth mating part has the inclined surface, and the third mating part and the fourth mating part cooperate to guide the heat dissipation member to enter or exit from the second opening.

[0010] In addition to or as an alternative to one or more features disclosed above, the fourth mating part is an edge side wall of the second opening adjacent to the first opening.

[0011] In addition to or as an alternative to one or more features disclosed above, at least a portion of the third mating part is inserted into the second opening and mated with the fourth mating part.

[0012] In addition to or as an alternative to one or more features disclosed above, the heat dissipation part is plural in quantity, and the plurality of heat dissipation parts are spaced apart along the moving direction of the optical

module inserted into the accommodating cavity; the first mating part and the second mating part that match each other are located between two adjacent heat dissipation parts.

[0013] In addition to or as an alternative to one or more features disclosed above, the first matching part is plural in quantity, and the plurality of first matching parts are spaced apart along the moving direction of the optical module inserted into the accommodating cavity; a quantity of the second mating part is equal to that of the first mating parts, and they correspond one-to-one; each of the first mating parts and the corresponding second mating part cooperate to guide the heat dissipation member to move toward the accommodating cavity.

[0014] In addition to or as an alternative to one or more features disclosed above, the second mating part is an elastic structure that presses the heat dissipation member toward the housing.

[0015] In addition to or as an alternative to one or more features disclosed above, the heat dissipation apparatus further includes an elastic member used on the heat dissipation member, and the elastic member is used to drive the heat dissipation member to move relative to the housing toward the first opening.

[0016] In addition to or as an alternative to one or more features disclosed above, the elastic member includes a mounting part, an elastic connecting part, and an abutting part. The mounting part is connected to the main body; one end of the elastic connecting part is connected to the mounting part, and another end of the elastic connecting part extends toward the housing; the abutting part is connected to the another end of the elastic connecting part, and is used to abut against the heat dissipation member to drive the heat dissipation member to move relative to the housing toward the first opening.

[0017] In addition to or as an alternative to one or more features disclosed above, the main body, the mounting part, the elastic connecting part, and the abutting part are an integral structure.

[0018] In addition to or as an alternative to one or more features disclosed above, when the optical module is inserted into the accommodating cavity, the heat dissipation member switches from a first state to a second state. In the first state, the first mating part and the second mating part are separated from each other. In the second state, the first mating part and the second mating part cooperate to guide the heat dissipation member to move toward the accommodating cavity.

[0019] One of the above technical solutions has the following advantages or beneficial effects:

[0020] The first mating part of the heat dissipation member is disposed on the side of the base facing away from the housing. The guide member includes a main body and a second mating part, the main body is connected to the housing, the second mating part is connected to the main body and located on the side of the base facing away from the housing, and the first mating part is located between the second mating part and the housing. When the optical module is inserted into the accommodating cavity, the first mating part and the second mating part cooperate to guide the heat dissipation member to move toward the accommodating cavity, so that the heat dissipation member is in thermal conduction contact with the optical module. In the heat dissipation apparatus of the present application, the guide member is connected to the housing and located on the side of the heat dissipation member facing away from the housing, and a transmission mating structure is directly formed between the guide member and

the heat dissipation member. Compared with the existing technology, the quantity of parts forming the transmission mating structure is less, and the structure of the heat dissipation apparatus is simpler.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The following detailed description of the specific embodiments of the present application are viewed in conjunction with the accompanying drawings for facilitating the technical solutions and other beneficial effects of the present application to be apparent.

[0022] FIG. 1 is a schematic diagram of a three-dimensional structure of a heat dissipation apparatus and an optical module in a separated state according to one embodiment of the present application;

[0023] FIG. 2 is a schematic diagram of a three-dimensional structure of the heat dissipation apparatus according to one embodiment of the present application;

[0024] FIG. 3 is a three-dimensional exploded view of the heat dissipation apparatus of FIG. 2;

[0025] FIG. 4 is a schematic view of the heat dissipation apparatus of FIG. 2;

[0026] FIG. 5 is a cross-sectional view taken along line A-A of FIG. 4;

[0027] FIG. 6 is a schematic view of a heat dissipation member in the heat dissipation apparatus of FIG. 2;

[0028] FIG. 7 is a schematic view of a guide member in the heat dissipation apparatus of FIG. 2;

[0029] FIG. 8 is a cross-sectional view taken along line B-B of FIG. 4;

[0030] FIG. 9 is a schematic diagram of a three-dimensional structure of the heat dissipation apparatus according to another embodiment of the present

application;

[0031] FIG. 10 is a three-dimensional exploded view of the heat dissipation apparatus of FIG. 9.

[0032] Descriptions of reference numerals: 1000-heat dissipation apparatus; 100-housing; 101-first opening; 103-second opening; 105-fourth mating part; 106-second arc-shaped surface; 107-accommodating cavity; 200-guide member; 201-main body; 209-hanging part; 211-second mating part; 212-first arc-shaped surface; 300-heat dissipation member; 301-attaching surface; 303-first mating part; 304-first inclined surface; 305-base; 307-heat dissipation part; 308-second heat dissipation cavity; 309-driving part; 310-first heat dissipation cavity; 311-third mating part; 312-second inclined surface; 313-abutting part; 500-elastic member; 501-mounting part; 503-elastic connecting part; 505-abutting part; 600-fastener; 2000-optical module; X-first direction; Z-second direction; Y-third direction.

DETAILED DESCRIPTION

[0033] In order to more clearly present the purpose, technical solutions, and beneficial effects of the present application, the following further describes the present application in detail with reference to the accompanying drawings and specific implementation manners. It should be understood that the specific implementation manners described in this specification are only for the purpose of explaining the present application and are not intended to limit the present application.

[0034] In the descriptions of the present application, it should be understood that the terms “center,” “longitudinal,” “lateral,” “length,” “width,” “thickness,”

“up,” “down,” “front,” “rear,” “left,” “right,” “vertical,” “orientational,” “top,” “bottom,” “inside,” “outside,” “clockwise,” “counterclockwise” and the like indicate directional or orientation al relationships based on the directions or positional relationships shown in the accompanying drawings, and are only for the convenience of describing the present application and simplifying the descriptions, and do not indicate or imply that the apparatus or element referred to must have a specific orientation, be constructed and operated in a specific orientation, and therefore cannot be understood as limiting the present application. In addition, the terms “first” and “second” are used for descriptive purposes only and cannot be understood as indicating or implying relative importance or implicitly indicating the number of the technical features indicated. Therefore, features defined as “first” and “second” may explicitly or implicitly include one or more of the said features. In the descriptions of the present application, the meaning of “multiple” refers to two or more, unless otherwise clearly and specifically defined.

[0035] In the description of the present application, it should be noted that, unless otherwise expressly specified or limited, the terms “installed,” “connected,” and “connected” should be understood in a broad sense. For example, they can refer to fixed connections, detachable connections, or integral connections; they can refer to mechanical connections, direct connections, or indirect connections through an intermediate medium, and they can refer to internal communication between two components or the interaction between two components. Those skilled in the art will understand the specific meanings of the above terms in the present application based on specific circumstances.

[0036] In the present application, unless otherwise expressly specified or

limited, a first feature being “above” or “below” a second feature may include the first and second features being in direct contact, or may include the first and second features not being in direct contact but being in contact via another feature between them. Furthermore, a first feature being “above,” “on top of,” and “over” a second feature may include the first feature being directly above or diagonally above the second feature, or may simply mean that the first feature is horizontally higher than the second feature. A first feature being “under,” “below,” and “beneath” a second feature may include the first feature being directly below or diagonally below the second feature, or may simply mean that the first feature is horizontally lower than the second feature.

[0037] Referring to FIG. 1, FIG. 1 is a three-dimensional structural diagram of a heat dissipation apparatus 1000 and an optical module 2000 in a separated state according to one embodiment of the present application.

[0038] The heat dissipation apparatus 1000 is used to dissipate heat from the optical module 2000. In one application scenario, the optical module 2000 moves along a first direction X and engages with a slot (not shown) on a mainboard (not shown), so as to be in electrical connection with the mainboard. The heat dissipation apparatus 1000 is disposed on the mainboard and corresponds to the slot. When the optical module 2000 is engaged and cooperates with the slot, the heat dissipation apparatus 1000 is in thermal conduction contact with the optical module 2000 and dissipates heat from the optical module 2000. Thermal conduction contact specifically refers to: a contact between the heat dissipation apparatus 1000 and the optical module 2000 for enabling heat transfer between contact areas.

[0039] Referring to FIG. 2 to FIG. 5, FIG. 2 is a schematic diagram of the three-

dimensional structure of the heat dissipation apparatus 1000 according to one embodiment of the present application, FIG. 3 is a three-dimensional exploded view of the heat dissipation apparatus 1000 of FIG. 2, FIG. 4 is a schematic view of the heat dissipation apparatus 1000 of FIG. 2, and FIG. 5 is a cross-sectional view taken along line A-A of FIG. 4.

[0040] For the convenience of description, the following definition is given below: the heat dissipation apparatus 1000 has the first direction X, a second direction Z, and a third direction Y that are perpendicular to each other.

[0041] The heat dissipation apparatus 1000 includes a housing 100, a heat dissipation member 300, and a guide member 200.

[0042] The housing 100 has an accommodating cavity 107, and a first opening 101 and a second opening 103 communicating with the accommodating cavity 107. The first opening 101 and the second opening 103 are respectively located on two adjacent sides of the accommodating cavity 107. Specifically, the housing 100 is substantially in a shape of a rectangular box. The first opening 101 is defined by four sidewalls extending along the first direction X. The second opening 103 is formed on a sidewall facing away from the mainboard.

[0043] The optical module 2000 is inserted into the accommodating cavity 107 from the first opening 101. In the above-mentioned application scenario, the housing 100 is disposed on the motherboard, and the slot is accommodated in the accommodating cavity 107. The part of the optical module 2000 inserted into the housing 100 is engaged and cooperates with the slot.

[0044] The heat dissipation member 300 is slidably disposed at the second opening 103. The heat dissipation member 300 is configured to be in thermal conduction contact with the optical module 2000 through the second opening 103

to dissipate heat for the optical module 2000. Specifically, the heat dissipation member 300 can be made of a thermally conductive material (e.g., aluminum alloy). The heat dissipation member 300 has an attaching surface 301. The heat dissipation member 300 is in contact with the optical module 2000 via the attaching surface 301, thereby dissipating the heat from the optical module 2000.

[0045] Reference is further made to FIG. 6, in which FIG. 6 is a schematic view of the heat dissipation member 300 in the heat dissipation apparatus 1000 of FIG. 2.

[0046] The heat dissipation member 300 includes a base 305, a heat dissipation part 307, a first mating part 303, and a driving part 309. In certain embodiments, the heat dissipation member 300 is an integrated structure to facilitate manufacturing and assembly. For example, the heat dissipation member 300 can be manufactured by casting.

[0047] The base 305 is movably disposed on a side of the housing 100 having the second opening 103. The above-mentioned attaching surface 301 is located on a side of the base 305 facing the housing 100. The shape of the attaching surface 301 matches the shape of a surface of the optical module 2000, such that the base 305 can fit closely to the optical module 2000, thereby maintaining a large contact area and good heat transfer. In the embodiment shown in FIG. 2, the attaching surface 301 is a flat surface.

[0048] The heat dissipation part 307 and the first mating part 303 are both disposed on a side of the base 305 facing away from the housing 100. Specifically, the heat dissipation part 307 is a heat dissipation fin. The use of heat dissipation fins facilitates the improvement of heat dissipation capacity.

[0049] The driving part 309 protrudes from a surface of the base 305 facing the

housing 100. Specifically, a part of the driving part 309 extends into the accommodating cavity 107 through the second opening 103. The part of the driving part 309 located in the accommodating cavity 107 is located on a moving path of the optical module 2000 in the first direction X.

[0050] Reference is further made to FIG. 7, in which FIG. 7 is a schematic view of the guide member 200 in the heat dissipation apparatus 1000 of FIG. 2.

[0051] The guide member 200 includes a main body 201 and a second mating part 211. In certain embodiments, the guide member 200 is an integral structure to facilitate manufacturing and assembly. For example, the guide member 200 can be manufactured by stamping a sheet metal.

[0052] The main body 201 is connected to the housing 100. Specifically, a quantity of the main body 201 is two, and the two main bodies 201 are respectively disposed on two opposite sides of the housing 100 and are respectively connected to the housing 100 by snap-fitting.

[0053] The second mating part 211 is connected to the main body 201 and located on the side of the base 305 facing away from the housing 100.

[0054] The first mating part 303 is located between the second mating part 211 and the housing 100. At least one of the first mating part 303 and the second mating part 211 has a first inclined surface 304. The first inclined surface 304 extends along a moving direction of the optical module 2000 into the accommodating cavity 107 and extends toward the accommodating cavity 107. Specifically, the first inclined surface 304 is a flat plane. An angle H defined between the first inclined surface 304 and the first direction X is 30°. This angle can be adjusted according to requirements.

[0055] In the embodiment shown in FIG. 2, the first inclined surface 304 is

located on the first mating part 303. In other embodiments, the first inclined surface 304 may also be located on the second mating part 211, or both the first mating part 303 and the second mating part 211 may have the first inclined surface 304.

[0056] When the optical module 2000 is inserted into the accommodating cavity 107 along the first direction X, the optical module 2000 abuts against the driving part 309 in the heat dissipation member 300, and the driving part 309 drives the heat dissipation member 300 to move synchronously. When the heat dissipation member 300 moves along the first direction X, the first mating part 303 and the second mating part 211 cooperate to guide the heat dissipation member 300 to move toward the accommodating cavity 107, such that the heat dissipation member 300 is in thermal conduction contact with the optical module 2000.

[0057] Specifically, the second mating part 211 has a first arc-shaped surface 212. When the heat dissipation member 300 moves along the first direction X, the first arc-shaped surface 212 abuts against the first inclined surface 304, and the second mating part 211 exerts a force on the heat dissipation member 300 along the second direction Z, thus causing the heat dissipation member 300 to simultaneously move along the second direction Z. When the heat dissipation member 300 moves along the second direction Z, the attaching surface 301 of the heat dissipation member 300 extends through the second opening 103 into the accommodating cavity 107, approaches the optical module 2000, and finally abuts against the optical module 2000.

[0058] The guide member 200 is located on a side of the heat dissipation member 300 facing away from the housing 100, and forms a transmission mating

structure with the heat dissipation member 300. Through the transmission mating structure, the attaching surface 301 of the heat dissipation member 300 and the optical module 2000 can be prevented from sliding relative to each other in the first direction X, thereby avoiding damage caused by friction.

[0059] Compared to the existing technology, the embodiments of the present application utilize fewer components to form the transmission mating structure, thereby resulting in a simpler structure of the heat dissipation apparatus 1000. In certain embodiments, when the optical module 2000 is inserted into the accommodating cavity 107, the heat dissipation member 300 switches from a first state to a second state. In the first state, the first mating part 303 and the second mating part 211 are separated. In the second state, the first mating part 303 and the second mating part 211 cooperate to guide the heat dissipation member 300 to move toward the accommodating cavity 107.

[0060] For ease of understanding, an insertion stroke of the optical module 2000 into the accommodating cavity 107 is divided into a first sub-stroke and a second sub-stroke. The optical module 2000 first passes through the first sub-stroke and then passes through the second sub-stroke. When the optical module 2000 is in the first sub-stroke, the heat dissipation member 300 is in the first state, and the heat dissipation member 300 and the guide member 200 are not in contact, thereby reducing the resistance for the insertion of the optical module 2000 into the accommodating cavity 107. When the optical module 2000 is in the second sub-stroke, the heat dissipation member 300 and the guide member 200 abut against each other and form the transmission mating structure. The guide member 200 exerts a force along the second direction Z to the heat dissipation member 300, thereby causing the heat dissipation member 300 to approach the optical

module 2000 and finally compress the optical module 2000 along the second direction Z. That is, before the optical module 2000 is inserted into the accommodating cavity 107 and when the optical module 2000 is in the first sub-stroke, the heat dissipation member 300 and the guide member 200 are not in contact. When the optical module 2000 is in the second sub-stroke, the heat dissipation member 300 and the guide member 200 come into contact and gradually press the heat dissipation member 300 against the optical module 2000, thereby achieving good thermal conduction contact. This can reduce the resistance when the optical module 2000 is inserted into the accommodating cavity 107, and can facilitate the design of a magnitude of an elastic force exerted by the second mating part 211 on the heat dissipation member 300 and a stroke length of the elastic force.

[0061] Reference is made to FIG. 5. In order for the heat dissipation member 300 to enter or exit the second opening 103 more stably, the following improvements are made.

[0062] In certain embodiments, the heat dissipation member 300 further includes a third mating part 311. The third mating part 311 is disposed on the side of the base 305 facing the housing 100. The housing 100 further includes a fourth mating part 105. At least one of the third mating part 311 and the fourth mating part 105 has a second inclined surface 312. The second inclined surface 312 extends along the moving direction of the optical module 2000 inserted into the accommodating cavity 107 and extends toward the interior of the accommodating cavity 107. The third mating part 311 and the fourth mating part 105 cooperate to guide the heat dissipation member 300 to enter or exit from the second opening 103.

[0063] Specifically, in the embodiment shown in FIG. 2, the second inclined surface 312 is located on the third mating part 311. The second inclined surface 312 is a flat surface. An angle defined between the second inclined surface 312 and the first direction X is 30° . When the optical module 2000 is inserted into the accommodating cavity 107 along the first direction X, the second inclined surface 312 abuts against the fourth mating part 105 to guide the heat dissipation member 300 to enter the second opening 103. When the optical module 2000 is removed from the accommodating cavity 107 in a direction opposite to the first direction X, the second inclined surface 312 abuts against the fourth mating part 105 to guide the heat dissipation member 300 to exit from the second opening 103.

[0064] In other embodiments, the second inclined surface 312 may further be located on the fourth mating part 105, and the second inclined surface 312 is configured to abut against the third mating part 311. In other embodiments, both the third mating part 311 and the fourth mating part 105 have the second inclined surface 312, and the second inclined surfaces 312 in the third mating part 311 and the fourth mating part 105 are configured to abut against each other.

[0065] In certain embodiments, the fourth mating part 105 is an edge sidewall of the second opening 103 close to the first opening 101. Therefore, there is no need to separately provide the fourth mating part 105, which facilitates simplifying the structure of the heat dissipation apparatus 1000.

[0066] In certain embodiments, at least a portion of the third mating part 311 is inserted into the second opening 103 and mated with the fourth mating part 105. Specifically, in the embodiment shown in FIG. 2, a portion of the second inclined surface 312 is inserted into the second opening 103 and abuts against the edge sidewall of the second opening 103, and since the second inclined surface 312

and the edge sidewall are constantly mated, the heat dissipation member 300 can be limited and slidably guided.

[0067] Reference is further made to FIG. 5.

[0068] In certain embodiments, the heat dissipation part 307 is plural in quantity. The plurality of heat dissipation parts 307 are spaced apart along the moving direction (the first direction X) of the optical module 2000 inserted into the accommodating cavity 107. The first mating part 303 and the second mating part 211 that cooperate with each other are located between two adjacent heat dissipation parts 307.

[0069] Specifically, in the embodiment shown in FIG. 2, the heat dissipation member 300 includes multiple (three sets) sets of heat dissipation parts 307. The multiple heat dissipation parts 307 in each set are spaced apart in the third direction Y. Two adjacent heat dissipation parts 307 form a first heat dissipation cavity 310 (see FIG. 4) in the third direction Y. Here, the plurality of sets of heat dissipation parts 307 are spaced apart in the first direction X. A second heat dissipation cavity 308 is formed between two adjacent sets of heat dissipation parts 307. The first mating part 303 and the second mating part 211 that cooperate with each other are located in the second heat dissipation cavity 308.

[0070] When assembling the heat dissipation apparatus 1000, the heat dissipation member 300 is placed on the side of the housing 100 having the second opening 103, the guide member 200 is disposed across a side of the heat dissipation member 300 facing away from the housing 100, the second mating part 211 is located in the second heat dissipation cavity 308, and the guide member 200 is connected to the housing 100.

[0071] Accordingly, space can be more reasonably utilized, such that the

structure of the heat dissipation apparatus 1000 becomes more compact to facilitate the assembling or disassembling of the heat dissipation apparatus 1000.

[0072] In certain embodiments, the heat dissipation member 300 and the guide member 200 form multiple transmission mating structures (two are shown in the figures), and the multiple transmission mating structures are spaced apart along the first direction X. Specifically, the first mating parts 303 are plural in quantity, and the first mating parts 303 are spaced apart along the moving direction of the optical module 2000 inserted into the accommodating cavity 107. The quantity of the second mating parts 211 is equal to the quantity of first mating parts 303, and they correspond one-to-one. Each of the first mating parts 303 cooperates with the corresponding second mating part 211 to guide the heat dissipation member 300 to move toward the accommodating cavity 107.

[0073] Referring to FIG. 8, FIG. 8 is a cross-sectional view taken along line B-B of FIG. 4.

[0074] In certain embodiments, the second mating part 211 is an elastic structure that presses the heat dissipation member 300 in a direction toward the housing 100. Specifically, the second mating part 211 can elastically deform in the second direction Z and its opposite direction, such that the attaching surface 301 of the heat dissipation member 300 elastically presses against the optical module 2000.

[0075] The second mating part 211 is an elastic piece. Specifically, a central part of the second mating part 211 is bent along the second direction Z toward the housing 100, such that the second mating part 211 is substantially in a shape of the letter “V,” and the guide member 200 is substantially in a shape of the letter “M.” The first arc-shaped surface 212 is located at a central region of the second

mating part 211 and is configured to abut against the first inclined surface 304. The guide member 200 can be made of stainless steel.

[0076] After the optical module 2000 is inserted in place along the first direction X, the second mating part 211 exerts an elastic force to the heat dissipation member 300 along the second direction Z, such that the heat dissipation member 300 is elastically pressed against the optical module 2000 along the second direction Z. Accordingly, the heat dissipation member 300 and the optical module 2000 can be better fitted, thereby improving the heat dissipation effect.

[0077] Reference is made to FIG. 2 and FIG. 3.

[0078] In order to enable the heat dissipation member 300 to be reset in time after the optical module 2000 exits the accommodating cavity 107, in certain embodiments, the heat dissipation apparatus 1000 further includes an elastic member 500.

[0079] The elastic member 500 acts on the heat dissipation member 300 to drive the heat dissipation member 300 to move relative to the housing 100 toward the first opening 101.

[0080] Specifically, in the embodiment shown in FIG. 2, the elastic member 500 is disposed outside the housing 100. The guide member 200 further includes a hanging part 209. The hanging part 209 is integrally formed with the mounting part 501. For example, the hanging part 209 is formed by a stamping process. The elastic member 500 is a spring. One end of the elastic member 500 along the first direction X is connected to the hanging part 209, and another end is connected to the heat dissipation member 300 via a fastener 600.

[0081] When the optical module 2000 is inserted into the accommodating

cavity 107 along the first direction X, the elastic member 500 is stretched and exerts an elastic force to the heat dissipation member 300 in the direction opposite to the first direction X. When the optical module 2000 exits from the accommodating cavity 107 in the direction opposite to the first direction X, the elastic member 500 abuts against the heat dissipation member 300 to move in the direction opposite to the first direction X.

[0082] The elastic member 500 is disposed outside the housing 100 to improve a space utilization rate inside the housing 100 and is conducive to reducing the volume of the housing 100.

[0083] In order to ensure that the force exerted on the heat dissipation member 300 is stable during the resetting process, a quantity of the elastic member 500 is two, and the two elastic members 500 are spaced apart in the third direction Y.

[0084] The elastic member 500 is not required. In one embodiment where the elastic member 500 is not provided, manual resetting can be performed.

[0085] Referring to FIG. 9 and FIG. 10, FIG. 9 is a schematic diagram of the three-dimensional structure of a heat dissipation apparatus 1000 according to another embodiment of the present application, and FIG. 10 is a three-dimensional exploded view of the heat dissipation apparatus 1000 of FIG. 9.

[0086] In certain embodiments, the third mating part 311 is disposed independently from the housing 100. This facilitates designing the position and shape of the third mating part 311. Specifically, the third mating part 311 is disposed on a surface of the housing 100 facing the heat dissipation member 300, and located on a side of the second opening 103 facing the first opening 101. The third mating part 311 has a second arc-shaped surface 106 and abuts against the second inclined surface 312 of the heat dissipation member 300 through the

second arc-shaped surface 106.

[0087] In addition, the embodiment shown in FIG. 9 further provides the elastic member 500 having another structural form. Correspondingly, the heat dissipation member 300 further includes an abutting part 313. The abutting part 313 protrudes from the surface of the base 305 facing the housing 100. The abutting part 313 is located outside the housing 100 and on a side of the housing 100 facing away from the first opening 101.

[0088] The elastic member 500 is disposed outside the housing 100. The elastic member 500 includes a mounting part 501, an elastic connecting part 503, and an abutting part 505. The mounting part 501 is connected to the main body 201. One end of the elastic connecting part 503 is connected to the mounting part 501, and another end extends toward the housing 100. The abutting part 505 is connected to the another end of the elastic connecting part 503. The abutting part 505 is located on a side of the abutting part 313 facing away from the housing 100. The abutting part 505 is used to abut against the abutting part 313 of the heat dissipation member 300 to drive the heat dissipation member 300 to move relative to the housing 100 toward the first opening 101.

[0089] When the optical module 2000 is inserted into the accommodating cavity 107 along the first direction X, the elastic member 500 elastically deforms and exerts an elastic force to the heat dissipation member 300 in the direction opposite to the first direction X. When the optical module 2000 exits from the accommodating cavity 107 in the direction opposite to the first direction X, the elastic member 500 abuts against the heat dissipation member 300 to move in the direction opposite to the first direction X.

[0090] In certain embodiments, the main body 201, the mounting part 501, the

elastic connecting part 503, and the abutting part 505 are an integrated structure to facilitate manufacturing and assembly. For example, the elastic member 500 can be manufactured by stamping a sheet metal.

[0091] In summary, in the heat dissipation apparatus 1000 of the present application, the guide member 200 is connected to the housing 100 and located on the side of the heat dissipation member 300 facing away from the housing 100, such that the guide member 200 directly forms a transmission mating structure with the heat dissipation member 300. Compared to the existing technology, the number of components forming the transmission mating structure is reduced, and the structure of the heat dissipation apparatus 1000 is simpler.

[0092] The above steps are merely provided to help understand the method, structure, and core concept of the present application. A person skilled in the art may make several improvements and modifications to the present application without departing from the principles of the present application, and such improvements and modifications also fall within the scope of protection of the claims of the present application.

CLAIMS

- [Claim 1] A heat dissipation apparatus configured to dissipate heat of an optical module, characterized in that, the heat dissipation apparatus comprises:
- a housing having an accommodating cavity and a first opening and a second opening communicating with the accommodating cavity, wherein the first opening and the second opening are respectively located on two adjacent sides of the accommodating cavity, and the optical module is inserted into the accommodating cavity through the first opening;
- a heat dissipation member, wherein the heat dissipation member is slidably disposed at the second opening, the heat dissipation member includes a base, a heat dissipation part, a first mating part, and a driving part; wherein the base is movably disposed on a side of the housing having the second opening, the heat dissipation part and the first mating part are both disposed on a side of the base facing away from the housing, and the driving part protrudes from a surface of the base facing the housing;
- a guide member, wherein the guide member includes a main body and a second mating part, the main body is connected to the housing, the second mating part is connected to the main body and located on the side of the base facing away from the housing, and the first mating part is located between the second mating part and the housing;
- wherein at least one of the first mating part and the second mating

part has an inclined surface, and the inclined surface extends along a moving direction of inserting the optical module into the accommodating cavity and extends toward the accommodating cavity; wherein, when the optical module is inserted into the accommodating cavity, the optical module drives the heat dissipation member to move synchronously through the driving part, and the first mating part and the second mating part cooperate to guide the heat dissipation member to move toward the accommodating cavity, so that the heat dissipation member is in thermal conduction contact with the optical module.

[Claim 2] The heat dissipation apparatus according to claim 1, characterized in that,

the heat dissipation member further includes a third mating part, and the third mating part is arranged on a side of the base facing the housing;

the housing further has a fourth mating part;

wherein at least one of the third mating part and the fourth mating part has the inclined surface, and the third mating part and the fourth mating part cooperate to guide the heat dissipation member to enter or exit from the second opening.

[Claim 3] The heat dissipation apparatus according to claim 2, characterized in that,

the fourth mating part is an edge side wall of the second opening adjacent to the first opening.

[Claim 4] The heat dissipation apparatus according to claim 3, characterized

in that,

at least a portion of the third mating part is inserted into the second opening and mated with the fourth mating part.

[Claim 5] The heat dissipation apparatus according to claim 1, characterized in that,

the heat dissipation part is plural in quantity, and the plurality of heat dissipation parts are spaced apart along the moving direction of the optical module inserted into the accommodating cavity;

the first mating part and the second mating part that match each other are located between two adjacent heat dissipation parts.

[Claim 6] The heat dissipation apparatus according to claim 1, characterized in that,

the first matching part is plural in quantity, and the plurality of first matching parts are spaced apart along the moving direction of the optical module inserted into the accommodating cavity;

a quantity of the second mating part is equal to that of the first mating part, and correspond one-to-one;

each of the first mating parts and the corresponding second mating part cooperate to guide the heat dissipation member to move toward the accommodating cavity.

[Claim 7] The heat dissipation apparatus according to claim 1, characterized in that,

the second mating part is an elastic structure that presses the heat dissipation member toward the housing.

[Claim 8] The heat dissipation apparatus according to claim 1, characterized

in that, the heat dissipation apparatus further comprises:

an elastic member used on the heat dissipation member, wherein the elastic member is used to drive the heat dissipation member to move relative to the housing toward the first opening.

[Claim 9] The heat dissipation apparatus according to claim 8, characterized in that, the elastic member comprises:

a mounting part connected to the main body;

an elastic connecting part, one end of which is connected to the mounting part, and another end of which extends toward the housing; and

an abutting part connected to the another end of the elastic connecting part, wherein the abutting part is used to abut against the heat dissipation member to drive the heat dissipation member to move relative to the housing toward the first opening.

[Claim 10] The heat dissipation apparatus according to claim 9, characterized in that,

the main body, the mounting part, the elastic connecting part, and the abutting part are an integrated structure.

[Claim 11] The heat dissipation apparatus according to claim 1, characterized in that,

when the optical module is inserted into the accommodating cavity, the heat dissipation member switches from a first state to a second state, wherein, in the first state, the first mating part and the second mating part are separated from each other, and wherein, in the second state, the first mating part and the second mating part

cooperate to guide the heat dissipation member to move toward the accommodating cavity.