United States Patent	12396133
Kind Code	B2
Date of Patent	August 19, 2025
Inventor(s)	Cai; Jiongjun

Heat sink for handheld game console

Abstract

A heat sink for a handheld game console is provided. The handheld game console includes a handheld game console body and heat dissipating holes defined on one side of the handheld game console body. The heat sink includes a heat sink housing, an air inlet defined on a surface of the heat sink housing, an air outlet defined on the surface of the heat sink housing, a heat dissipating fan arranged in the heat sink housing, and a circuit board arranged in the heat sink housing. A flow guide groove is formed between the air inlet and the air outlet. The heat dissipating fan is connected to the flow guide groove to form a flow guide cavity. The air inlet is connected to the heat dissipating holes on the one side of the handheld game console body.

Inventors: **Cai; Jiongjun (Shenzhen, CN)**

Applicant: **SHENZHEN DEONE INNOVATION TECHNOLOGY CO., LTD** (Shenzhen, CN)

Family ID: **1000008767009**

Assignee: **SHENZHEN DEONE INNOVATION TECHNOLOGY CO., LTD (Shenzhen, CN)**

Appl. No.: **18/346972**

Filed: **July 05, 2023**

Prior Publication Data

Document Identifier	Publication Date
US 20240244794 A1	Jul. 18, 2024

Foreign Application Priority Data

CN	202320114870.6	Jan. 18, 2023

Publication Classification

Int. Cl.: **H05K7/20** (20060101); **A63F13/90** (20140101); **A63F13/98** (20140101); **G06F1/20** (20060101)

U.S. Cl.:

CPC **H05K7/2039** (20130101); **A63F13/98** (20140902); **H05K7/20154** (20130101); **H05K7/20209** (20130101);

Field of Classification Search

CPC: H05K (7/2039); H05K (7/20154); H05K (7/20209); A63F (13/98)

USPC: 361/697

References Cited

U.S. PATENT DOCUMENTS

Patent No.	Issued Date	Patentee Name	U.S. Cl.	CPC
5171183	12/1991	Pollard	N/A	G11B 33/142
5704212	12/1997	Erler	361/679.48	F25B 21/04
5898568	12/1998	Cheng	415/203	H05K 5/0273
6034871	12/1999	Cheng	165/104.34	G06F 1/203
6104607	12/1999	Behl	415/213.1	G06F 1/203
6141214	12/1999	Ahn	361/679.48	G06F 1/203
6459575	12/2001	Esterberg	165/185	G06F 1/203
6781833	12/2003	Lu	361/756	G06F 1/20
6826047	12/2003	Chen	361/679.48	G06F 1/203
6837058	12/2004	McEuen	361/679.48	G06F 1/203
7325406	12/2007	Lee	62/3.2	G06F 1/20
D568411	12/2007	Navid	D21/333	N/A
7564681	12/2008	Chen	361/695	G06F 1/20
7619887	12/2008	Koch	361/689	H05K 7/20781
7859840	12/2009	Chang	361/695	G06F 1/1632
7948754	12/2010	Huang	361/679.48	G06F 1/203
8405973	12/2012	Huang	415/203	G06F 1/203
8926414	12/2014	Kirkpatrick	361/679.41	G06F 1/203
D893499	12/2019	Kirkpatrick	D14/447	N/A
D983208	12/2022	Kirkpatrick	D14/447	N/A
D995750	12/2022	Ou	D23/370	N/A
2007/0253162	12/2006	Naghi	361/695	F04D 29/601
2008/0186673	12/2007	Hsu	361/679.46	H05K 7/20536
2014/0233183	12/2013	Horng	361/692	G06F 1/203
2016/0066477	12/2015	Liu	29/890.035	G06F 1/1656

Primary Examiner: Vortman; Anatoly

Attorney, Agent or Firm: HOWARD M COHN and Associates, LLC

Background/Summary

TECHNICAL FIELD

(1) The present disclosure relates to a technical field of handheld game consoles, and in particular to a heat sink for a handheld game console.

BACKGROUND

(2) A handheld game console is also known as a portable game console, a portable gamepad, or a portable game console. Since the handheld game console is portable and brings entertainment for people in a short period of time (such as waiting for a bus, waiting in line), the handheld game console is favored by consumers. The handheld game console generates heat when the handheld game console is operated, and the heat is easy to accumulate in a housing of the handheld game console. If the heat is not dissipated in time, the handheld game console may work under a high temperature environment, shortening the service life of components inside the handheld game console, and even damaging the handheld game console in serious cases.

(3) The handheld game console in the prior art generally dissipates heat inside a main body of the handheld game console through heat dissipating holes on a housing of the handheld game console. Such heat dissipation method mainly realizes heat dissipation inside the housing through molecular thermal movement to make molecules overflow. However, only part of the heat inside the main body of the handheld game console is dissipated by adopting the heat dissipation method. Therefore, how to provide a heat dissipation device to make the handheld game machine dissipate heat thoroughly and timely is a problem that the technical person in the field needs to solve urgently.

SUMMARY

(4) In view of this, the present disclosure provides a heat sink for a handheld game console. By defining a flow guide groove between the air inlet and air outlet of the heat sink for the handheld game console, a heat dissipating fan is communicated with the flow guide groove to form a flow guide cavity, so that the air inlet is matched with and connected to heat dissipating holes on one side of a handheld game console body, which in turn enables heat inside the handheld game console to be completely discharged from the heat sink housing in time, thereby effectively avoiding the handheld game console from being under a high temperature environment for a long time. Therefore, shortening of service life of components inside the handheld game console and burning out of the handheld game console are avoided.

(5) The present disclosure provides the heat sink for the handheld game console. The handheld game console comprises a handheld game console body and heat dissipating holes defined on one side of the handheld game console body. The heat sink comprises a heat sink housing, an air inlet defined on a surface of the heat sink housing, an air outlet defined on the surface of the heat sink housing, a heat dissipating fan arranged in the heat sink housing, and a circuit board arranged in the heat sink housing.

(6) A flow guide groove is formed in the heat sink housing. The flow guide groove is communicated with the air inlet and the air outlet. The heat dissipating fan is connected to the flow guide groove to form a flow guide cavity. The air inlet is connected to the heat dissipating holes on the one side of the handheld game console body.

(7) Furthermore, the heat dissipating fan comprises a heat dissipating fan shell and fan blades. The heat dissipating fan shell comprises an air inlet flow guide port and an air outlet flow guide port. The fan blades face the air inlet flow guide port. The air inlet flow guide port faces the air inlet. The air outlet flow guide port faces the air outlet. The air inlet flow guide port is communicated with the flow guide groove to form the flow guide cavity.

(8) Furthermore, the heat sink housing comprises a bottom shell and a top cover. The bottom shell

and the top cover are connected to form an accommodating cavity. The heat dissipating fan and the circuit board are arranged in the accommodating cavity. An outer side surface of the bottom shell is attached to the handheld game console body. Furthermore, the flow guide groove is defined on an inner surface of the bottom shell. The inner surface faces the top cover. The air inlet flow guide port is communicated with the flow guide groove to form the flow guide cavity.
(9) Furthermore, the air inlet flow guide port is attached to a rim of the flow guide groove to form the flow guide cavity.
(10) Furthermore, the air inlet is defined on the bottom shell. The air inlet is matched with and communicated with the heat dissipating holes on the one side of the handheld game console body.
(11) Furthermore, the air outlet is defined on the bottom shell. The air outlet is away from the air inlet.
(12) Furthermore, a fan speed regulator is arranged on the circuit board, and the fan speed regulator is configured to adjust a rotation speed of the heat dissipating fan.
(13) Compared with the prior art, in the heat sink for the handheld game console of the present disclosure, by defining the flow guide groove between the air inlet and air outlet of the heat sink for the handheld game console, the heat dissipating fan is communicated with the flow guide groove to form the flow guide cavity, so that the air inlet is communicated with the heat dissipating holes on the one side of the handheld game console body. Through rotation of the heat dissipating fan, air inside the handheld game console is introduced into the flow guide cavity, and the heat dissipating fan accelerates and guides the air, so that the air is discharged through the air outlet, which in turn enables heat inside the handheld game console to be completely discharged from the heat sink housing in time, thereby effectively avoiding the handheld game console from being under the high temperature environment for a long time. Therefore, shortening of the service life of the components inside the handheld game console and burning out of the handheld game console are avoided.

Description

BRIEF DESCRIPTION OF DRAWINGS
(1) FIG. **1** is a schematic diagram of a heat sink for a handheld game console according to one embodiment of the present disclosure where the heat sink is to be assembled to the handheld game console.
(2) FIG. **2** is a schematic diagram of the heat sink for the handheld game console according to one embodiment of the present disclosure where the heat sink is assembled to the handheld game console.
(3) FIG. **3** is a structural schematic diagram of the heat sink for the handheld game console according to one embodiment of the present disclosure.
(4) FIG. **4** is another structural schematic diagram of the heat sink for the handheld game console according to one embodiment of the present disclosure.
(5) FIG. **5** is a cross-sectional schematic diagram of the heat sink for the handheld game console shown in FIG. **3**.
(6) FIG. **6** is an exploded schematic diagram of the heat sink for the handheld game console shown in FIG. **3**.
(7) FIG. **7** is a structural schematic diagram of a flow guide groove of the heat sink for the handheld game console according to one embodiment of the present disclosure.
(8) FIG. **8** is a schematic diagram of a heat dissipating fan according to one embodiment of the present disclosure.
(9) FIG. **9** is another schematic diagram of the heat dissipating fan according to one embodiment of the present disclosure.

DETAILED DESCRIPTION

(10) In order to well understand the purpose, structure, features and functions of the present disclosure, a heat sink for a handheld game console of the present disclosure will be further described in conjunction with the accompanying drawings and specific embodiments.

(11) As shown in FIGS. **1**-**9**, the present disclosure provides the heat sink for the handheld game console. The handheld game console comprises a handheld game console body **10** and heat dissipating holes **101** defined on one side of the handheld game console body **10**. The heat sink comprises a heat sink housing **20**, an air inlet **201** defined on a surface of the heat sink housing **20**, an air outlet **202** defined on the surface of the heat sink housing **20**, a heat dissipating fan **203** arranged in the heat sink housing **20**, and a circuit board **204** arranged in the heat sink housing **20**. A flow guide groove **205** is formed on the heat sink housing **20**. The flow guide groove **205** is communicated with the air inlet **201** and the air outlet **202**. The heat dissipating fan **203** is communicated with the flow guide groove **205** to form a flow guide cavity **28**. The air inlet **201** is communicated with the heat dissipating holes **101** on the one side of the handheld game console body **10**.

(12) In the embodiment, the handheld game console body **10** comprises four sides, which are respectively a top side, a bottom side, a left side, and a right side. Any two sides arranged opposite to each other, of the four sides, are parallel to each other, and the heat dissipating holes **101** of the handheld game console body **10** are defined on the top side of the handheld game console body **10**. Of course, in other embodiments, the heat dissipating holes **101** of the handheld game console body may also be defined on other side of the handheld game console body **10**, such as the bottom side, the left side, or the right side of the handheld game console body **10**, which is not limited thereto.

(13) The air inlet **201** and the air outlet **202** of the heat sink are defined on the surface of the heat sink housing **20**. The heat dissipating fan **203** and the circuit board **204** of the heat sink are arranged inside the heat sink housing **20**. The flow guide groove is U-shaped and is formed between the air inlet **201** and the air outlet **202**. A rear portion of the flow guide groove **205** is attached to an inner side surface of the heat sink housing **20** to form a closed side surface. A front portion of the flow guide groove **205** defines an open portion. The open portion faces the air inlet **201**. A top portion of the flow guide groove **205** defines a top opening. The top opening faces the air outlet **202**. The heat dissipating fan **203** is connected to the flow guide groove **205** to form the flow guide cavity **28**. Specifically, the heat dissipating fan **203** is communicated with the open portion on the front portion of the flow guide groove **205** to form the flow guide cavity **28**. A front surface of the heat dissipating fan **203** faces the open portion. The air inlet **201** is communicated with the heat dissipating holes **101** defined on the one side of the handheld game console body **10**. Specifically, the air inlet **201** is aligned with and attached to the heat dissipating holes **101** on the one side of the handheld game console body **10**. An opening area of the air inlet **201** is not less than an opening area of the heat dissipating holes **101** on the one side of the handheld game console body **10**.

(14) By defining the flow guide groove **205** between the air inlet **201** and air outlet **202** of the heat sink for the handheld game console, the heat dissipating fan **203** is communicated with the flow guide groove **205** to form the flow guide cavity **28**, so that the air inlet **201** is communicated with the heat dissipating holes **101** on the one side of the handheld game console body **10**. Through rotation of the heat dissipating fan **203**, air inside the handheld game console is introduced into the flow guide cavity **28**, and the heat dissipating fan **203** accelerates and guides the air, so that the air is discharged through the air outlet **202**, which in turn enables heat inside the handheld game console to be completely discharged from the heat sink housing in time, thereby effectively avoiding the handheld game console from being under a high temperature environment for a long time. Therefore, shortening of service life of components inside the handheld game console and burning out of the handheld game console are avoided.

(15) As shown in FIGS. **4**-**9**, the heat dissipating fan **203** comprises a heat dissipating fan shell and

fan blades **2031**. The heat dissipating fan shell comprises an air inlet flow guide port **231** and an air outlet flow guide port **232**. The fan blades **2031** are arranged at the air inlet flow guide port **231**. The air inlet flow guide port **231** faces the air inlet **201**. The air outlet flow guide port **232** faces the air outlet **202**. The air inlet flow guide port **231** is communicated with the flow guide groove **205** to form the flow guide cavity **28**.

(16) In the embodiment, the air inlet flow guide port **231** is communicated with the flow guide groove **205** to form the flow guide cavity **28**. The heat dissipating fan shell is connected and attached to a rim **240** of the flow guide groove **205**. Of course, in other embodiments, the air inlet flow guide port **231** is clamped with the flow guide groove **205** or the air inlet flow guide port **231** is connected to the flow guide groove **205** by another connection mode, which is not limited thereto. Through rotation of the fan blades **2031**, the air inside the handheld game console is introduced into the flow guide cavity **28**, and the heat dissipating fan **203** accelerates and guides the air, so that the air is discharged through the air outlet **202**, which in turn enables the heat inside the handheld game console to be completely discharged from the heat sink housing.

(17) In one optional embodiment of the present disclosure, an area of the air inlet flow guide port **231** matches an area of the fan blades **2031**. Specifically, the area of the air inlet flow guide port **231** is equal to an area of a circle formed by combining the fan blades **2031**. Of course, in other embodiments, the area of the air inlet flow guide port **231** maybe greater than the area of the circle formed by combining the fan blades, or the area of the air inlet flow guide port **231** may be less than the area of the circle formed by combining the fan blades, which is not limited thereto.

(18) As shown in FIGS. **5-7**, the heat sink housing **20** comprises a bottom shell **206** and a top cover **207**, the bottom shell **206** and the top cover **207** are connected to form an accommodating cavity **210**. The bottom shell **206** is connected to the top cover **207** through fasteners. Of course, in other embodiments, the bottom shell **206** is clamped with the top cover **207** or the bottom shell **206** is bonded to the top cover **207**, which is not limited thereto. The heat dissipating fan **203** and the circuit board **204** are arranged in the accommodating cavity **210**. An outer side surface of the bottom shell **206** is attached to the handheld game console body **10**. The flow guide groove **205** is defined on an inner surface **209** of the bottom shell **206**. The inner surface **209** of the bottom shell faces the top cover **207**. The air inlet flow guide port **231** is communicated with the flow guide groove **205** to form the flow guide cavity **28**.

(19) In one optional embodiment of the present disclosure, the heat dissipating fan shell is attached to a rim **240** of the flow guide groove **205** to form the flow guide cavity **28**. Of course, in other embodiments, the air inlet flow guide port **231** may be connected to the groove surface of the flow guide groove **205** in other forms, e.g., the air inlet flow guide port **231** may be clamped with the groove surface of the flow guide groove **205** or air inlet flow guide port **231** may be embedded in the groove surface of the flow guide groove **205**, which is not limited thereto.

(20) As shown in FIGS. **1-6**, the air inlet **201** is defined on the bottom shell **206**. The air inlet **201** is matched with and communicated with the heat dissipating holes **101** on the one side of the handheld game console body **10**. The air outlet **202** is defined on the bottom shell **206**. The air outlet **202** is away from the air inlet **201**. Of course, in other embodiments, the air inlet **201** may be defined on the bottom shell **206** of the heat sink for the handheld game console, and the air outlet **202** is defined on the top cover **207**. Alternatively, the air outlet **202** is defined on the bottom shell **206** and the top cover **207** of the heat sink for the handheld game console, which is not limited thereto.

(21) In the embodiment, the heat sink housing **20** comprises a long portion **2061**, a short portion **2062**, and a groove **2063** located between the long portion **2061** and the short portion **2062**. The short portion **2062** is arranged adjacent to the groove **2063**. The groove **2063** is arranged adjacent to the long portion **2061**. The long portion **2061**, the groove **2063**, and the short portion **2062** are sequentially arranged to form an inverted L-shaped structure. The inverted L-shaped structure is snapped on the handheld game console body **10**.

(22) In one optional embodiment of the present disclosure, the long portion **2061**, the groove **2063**, and the short portion **2062** of the heat sink housing **20** are integrally formed. Specifically, the heat sink housing **20** comprises the long portion **2061**, the short portion **2062**, and the groove **2063** located between the long portion **2061** and the short portion **2062**. The short portion **2062** is arranged adjacent to the groove **2063**. The groove **2063** is arranged adjacent to the long portion **2061**. The long portion **2061**, the groove **2063**, and the short portion **2062** are sequentially arranged to form the inverted L-shaped structure. The bottom shell **206** of the inverted L-shaped structure is snapped on the handheld game console body **10**.
(23) Furthermore, the groove **2063** comprises an inner side surface and an outer side surface. The air inlet **201** is defined on a bottom portion of the inner side surface of the groove **2063**. The air outlet **202** is defined on the outer side surface of the groove **2063**. The inner side surface of the groove **2063** is attached to the one side of the handheld game console body where the heat dissipating holes are defined. The air inlet **201** is attached to the heat dissipating holes defined on the one side of the handheld game console body.
(24) The long portion **2061** comprises a first side surface arranged adjacent to the inner side surface of the groove **2063** and a second side surface arranged adjacent to the outer side surface of the groove **2063**. The first side surface of the long portion **2061** is attached to a rear side of the handheld game console body **10**.
(25) The short portion **2062** comprises a third side surface arranged adjacent to the inner side surface of the groove **2063** and a fourth side surface arranged adjacent to the outer side surface of the groove **2063**. The third side surface is attached to a front side of the handheld game console body **10**.
(26) In the embodiment, the heat sink housing **20** is arranged in the inverted L-shaped structure, so that the long portion **2061** of the heat sink housing **20** is attached to the rear side of the handheld game console body **10**, and the short portion **2062** is attached to the front side of the handheld game console body **10**. Therefore, the handheld game console body **10** is clamped in the groove **2063** of the inverted L-shaped structure of the heat sink housing **20**, thereby effectively clamping the handheld game console body **10** and preventing the heat sink from falling off from the handheld game console body **10**.
(27) In one optional embodiment of the present disclosure, the heat dissipating fan **203** and the circuit board **204** are arranged in the long portion **2061** of the heat sink housing **20**. Specifically, the heat dissipating fan **203** is arranged in an upper half space of the long portion **2061** of the heat sink housing **20**. The circuit board **204** is arranged in a lower half space of the long portion **2061** of the heat sink housing **20**.
(28) In the embodiment, the heat dissipating fan **203** and the circuit board **204** are arranged in the long portion **2061** of the heat sink housing **20**, so that a center of gravity of the heat sink falls on the rear side of the handheld game console body **10**, thereby further preventing the heat sink from falling off from the handheld game console body **10** and the heat sink is clamped firmly.
(29) As shown in FIGS. **6-7**, a fan speed regulator **220** is arranged on the circuit board **204**, and the fan speed regulator **220** is configured to adjust a rotation speed of the heat dissipating fan **203**.
(30) In the embodiment, the fan speed regulator **220** is a knob switch. The knob switch is electrically connected to the circuit board **204**. The rotation speed of the heat dissipating fan **203** is adjusted by rotating the knob switch.
(31) To sum up, in the heat sink for the handheld game console of the present disclosure, the heat sink housing is arranged in the inverted L-shaped structure, so that the long portion of the heat sink housing is attached to the rear side of the handheld game console body, and the short portion is attached to the front side of the handheld game console body. Therefore, the handheld game console body is clamped in the groove of the inverted L-shaped structure of the heat sink housing. Moreover, the heat dissipating fan and the circuit board are arranged in the long portion of the heat sink housing, so that the center of the gravity of the heat sink falls on the rear side of the handheld

game console body, thereby further preventing the heat sink from falling off from the handheld game console body and the heat sink is clamped firmly.
(32) The above detailed description is only a description of optional embodiments of the present disclosure, and does not limit the patent scope of the present disclosure. Therefore, all equivalent technical changes made based on the description and illustrations of the present disclosure are included in the protection scope of the present disclosure.

Claims

1. A heat sink for a handheld game console defining a handheld game console body and heat dissipating holes defined on one side of the handheld game console body, comprising: a heat sink housing, an air inlet defined on a surface of the heat sink housing, an air outlet defined on the surface of the heat sink housing, a heat dissipating fan arranged in the heat sink housing, and a circuit board arranged in the heat sink housing; wherein the heat sink housing comprises a flow guide groove; the flow guide groove is communicated with the air inlet and the air outlet; the heat dissipating fan comprises a heat dissipating fan shell and fan blades; the heat dissipating fan shell comprises an air inlet flow guide port and an air outlet flow guide port; the air inlet flow guide port of the heat dissipating fan is communicated with the flow guide groove to form a flow guide cavity; the air inlet is communicated with the heat dissipating holes on the one side of the handheld game console body; wherein the air inlet flow guide port faces the air inlet; the air outlet flow guide port faces the air outlet.
2. The heat sink according to claim 1, wherein the fan blades are disposed in the heat dissipating fan shell, and the fan blades face the air inlet flow guide port.
3. The heat sink according to claim 1, wherein the heat sink housing comprises a bottom shell and a top cover; the bottom shell and the top cover are connected to form an accommodating cavity; the heat dissipating fan and the circuit board are arranged in the accommodating cavity; an outer side surface of the bottom shell is attached to the handheld game console body.
4. The heat sink according to claim 3, wherein the flow guide groove is defined on an inner surface of the bottom shell, and the inner surface of the bottom shell faces the top cover.
5. The heat sink according to claim 4, wherein the heat dissipating fan shell is attached to a rim of the flow guide groove to form the flow guide cavity.
6. The heat sink according to claim 3, wherein the air inlet is defined on the bottom shell; the air inlet is matched with and communicated with the heat dissipating holes on the one side of the handheld game console body.
7. The heat sink according to claim 3, wherein the air outlet is defined on the bottom shell; the air outlet is away from the air inlet.
8. The heat sink according to claim 1, wherein a fan speed regulator is arranged on the circuit board, and the fan speed regulator is configured to adjust a rotation speed of the heat dissipating fan.