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(54) **FAN ASSEMBLY**

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F04D 29/60 (2006.01)
F04D 25/16 (2006.01)
H05K 7/20 (2006.01)

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(58) **Field of Classification Search**

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F04D 25/166; F04D 29/4226; F04D 29/4253; F04D 29/60-603; F04D 29/646; H05K 7/20172; G06F 1/20

See application file for complete search history.

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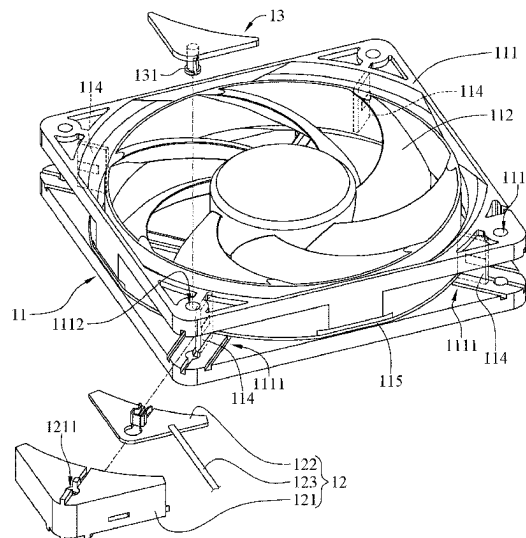
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ABSTRACT

A fan assembly including at least one fan device and a first attachment device. The at least one fan device includes a frame, an impeller, a driving component and at least one in-built electrical port. The impeller is rotatably disposed at the frame. The driving component is configured to drive the impeller to rotate relative to the frame. The at least one in-built electrical port is disposed at the frame and electrically connected to the driving component. The first attachment device includes a first casing, a first external electrical port and a terminal cable. The first casing is detachably mounted at the frame. The first external electrical port is disposed at the first casing and detachably assembled with the at least one in-built electrical port. An end of the terminal cable is electrically connected to the first external electrical port.

8 Claims, 10 Drawing Sheets

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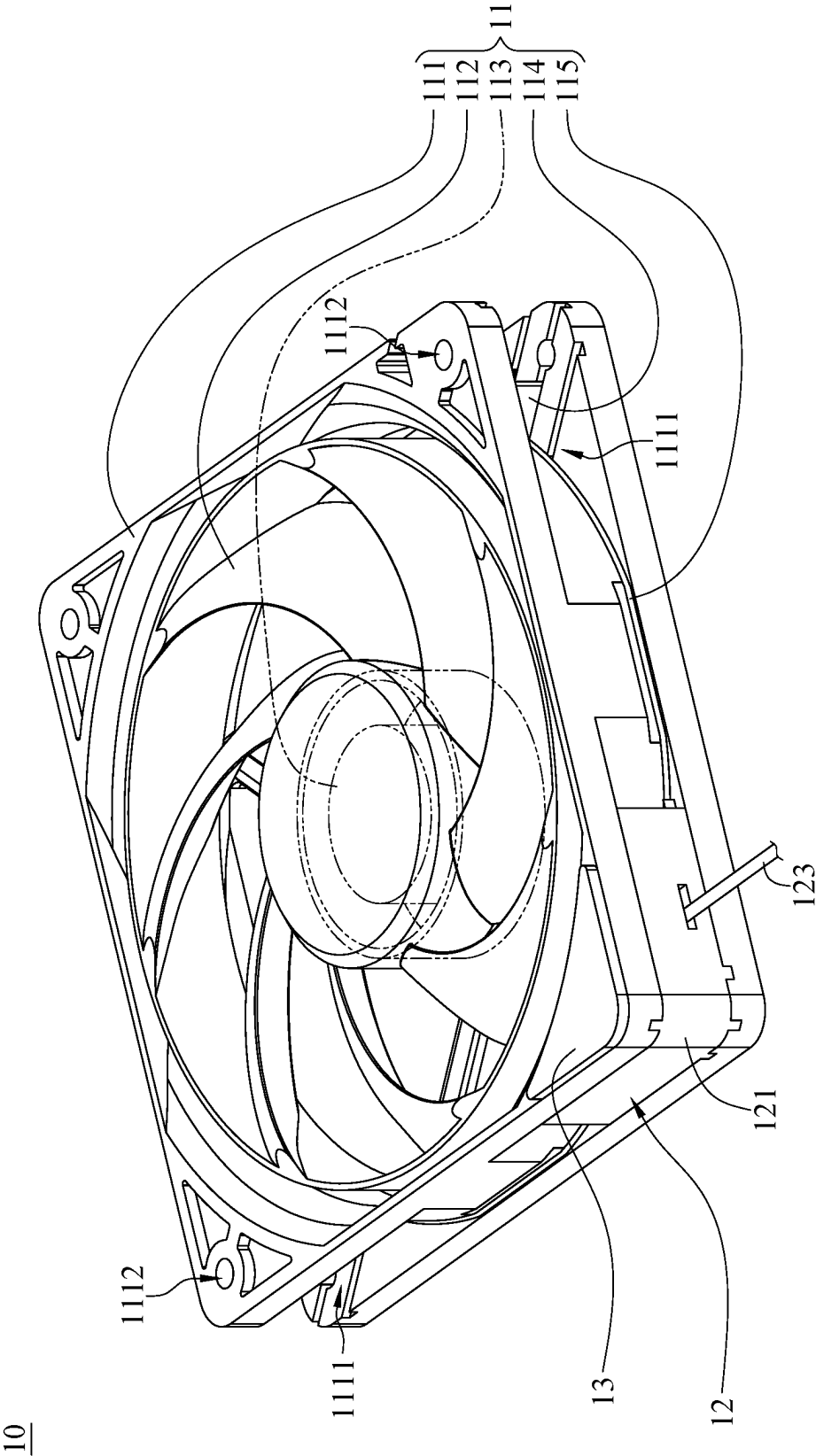


FIG. 1

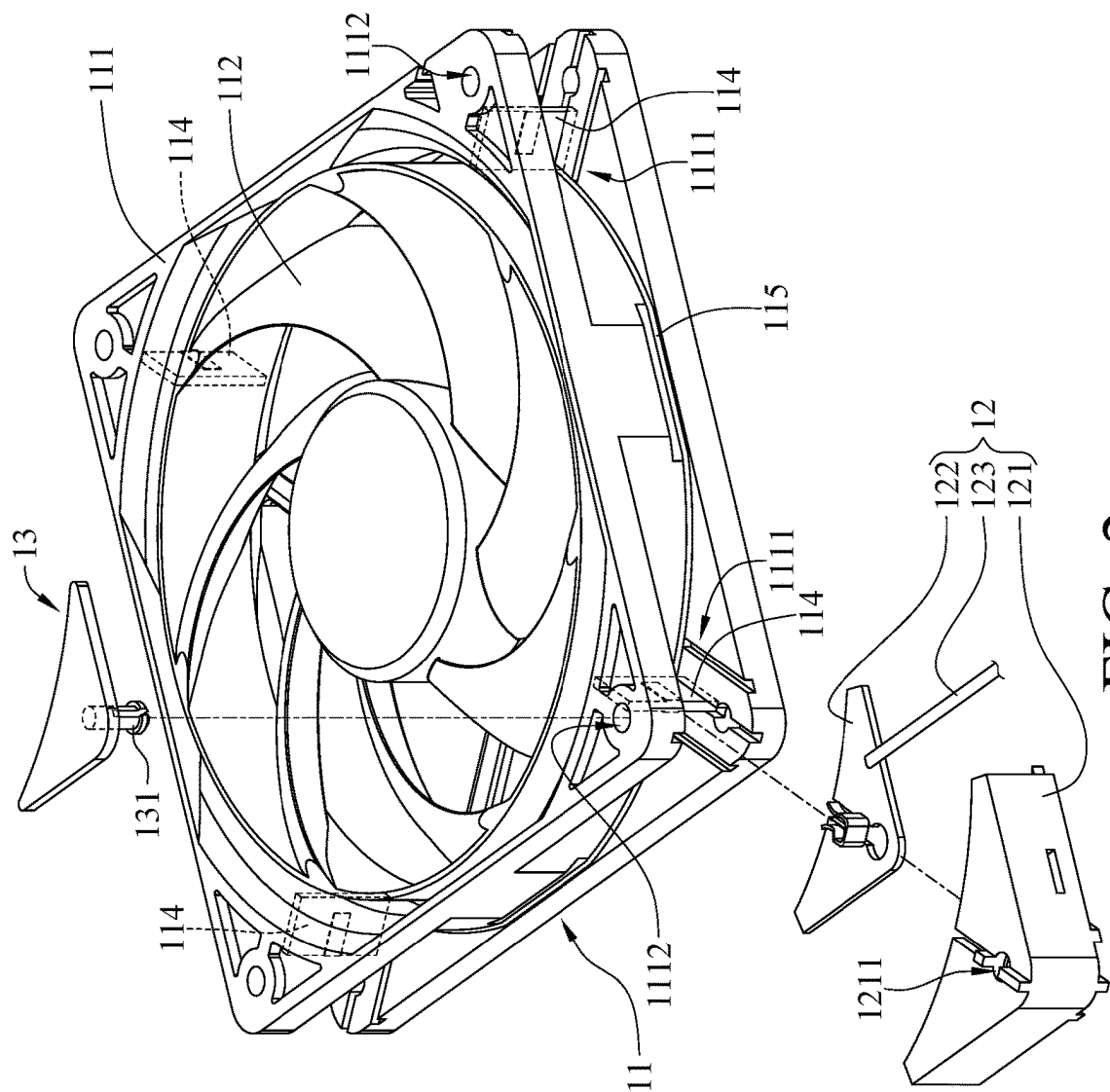


FIG. 2

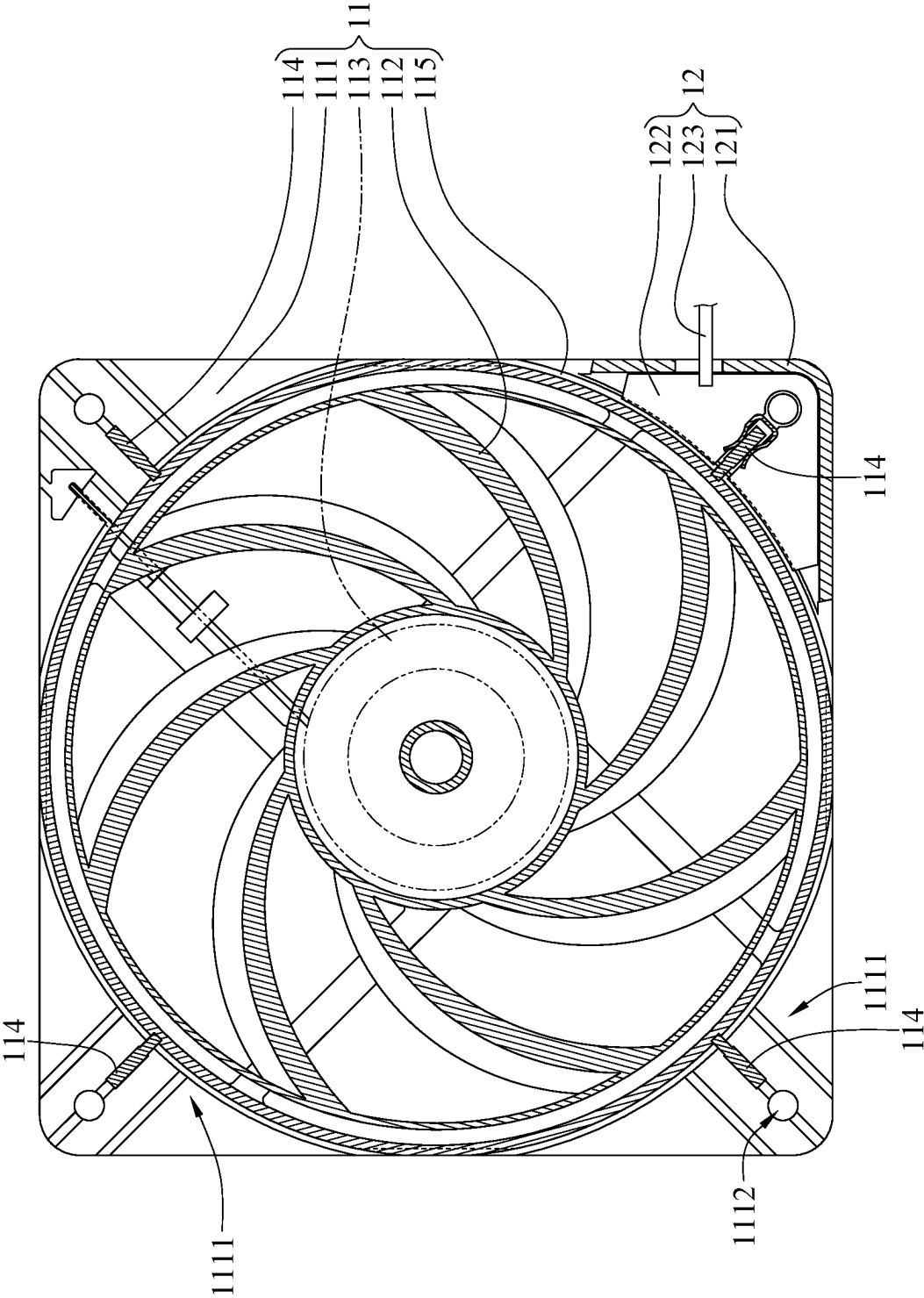


FIG. 3

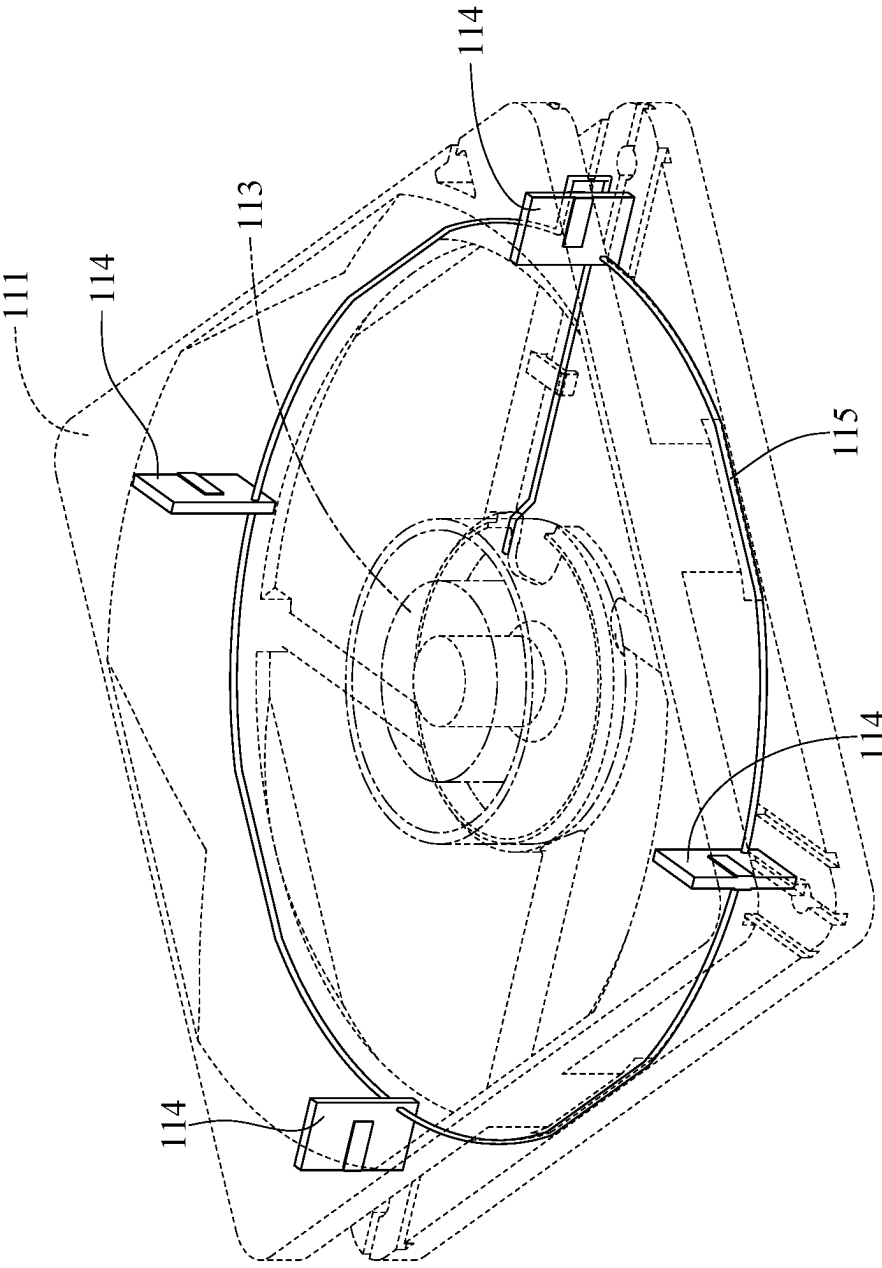


FIG. 4

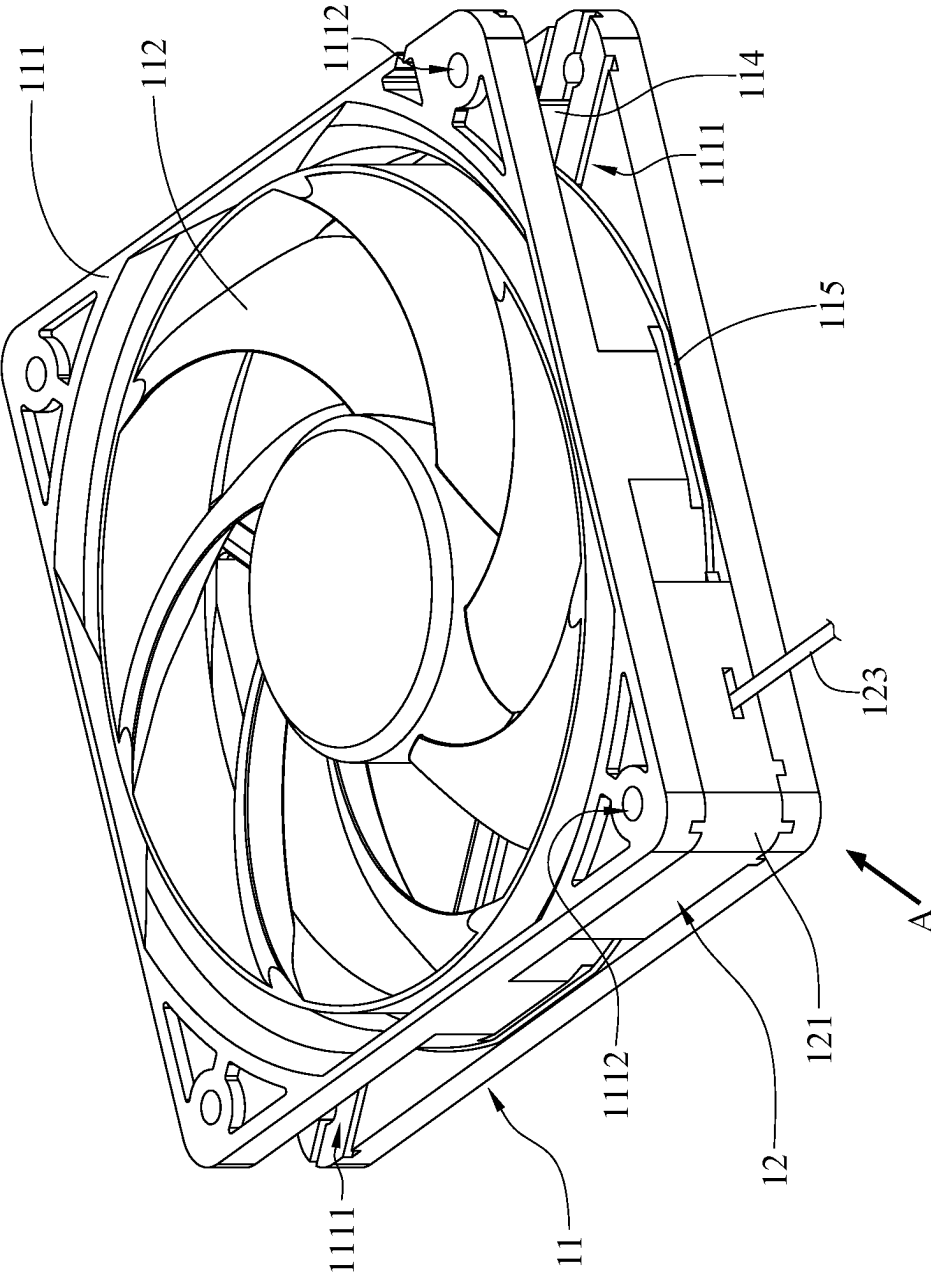


FIG. 5

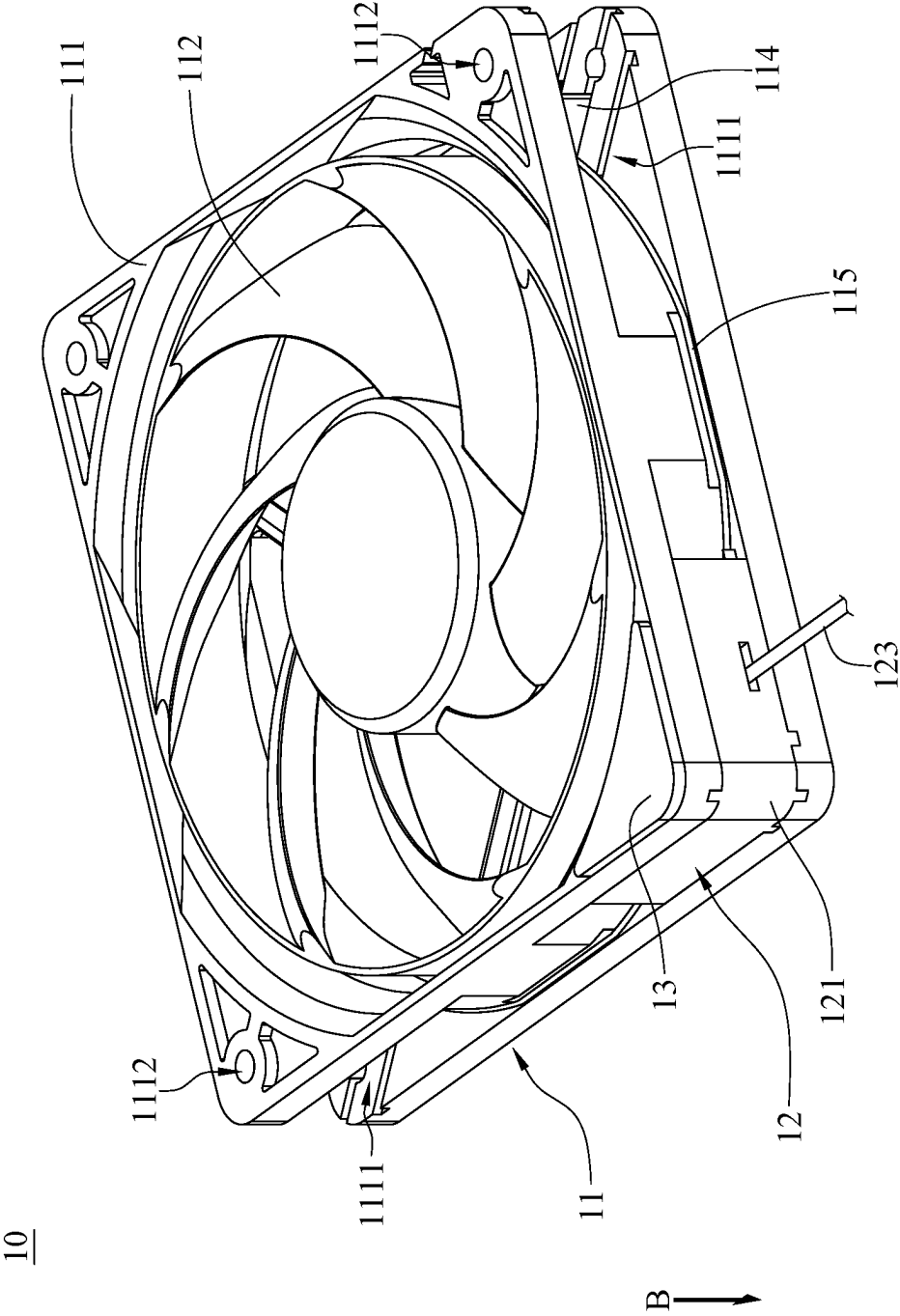


FIG. 6

10A

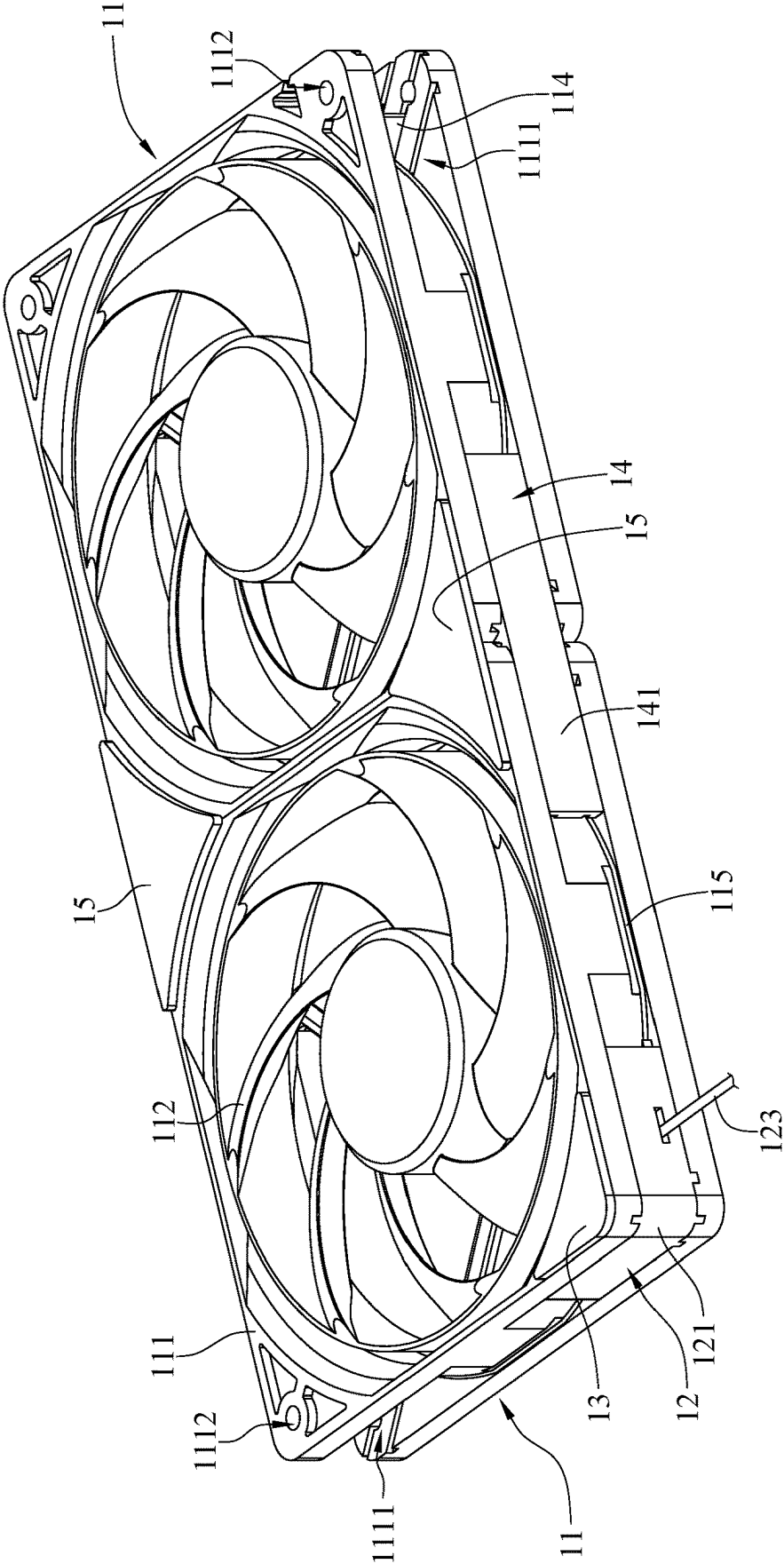


FIG. 7

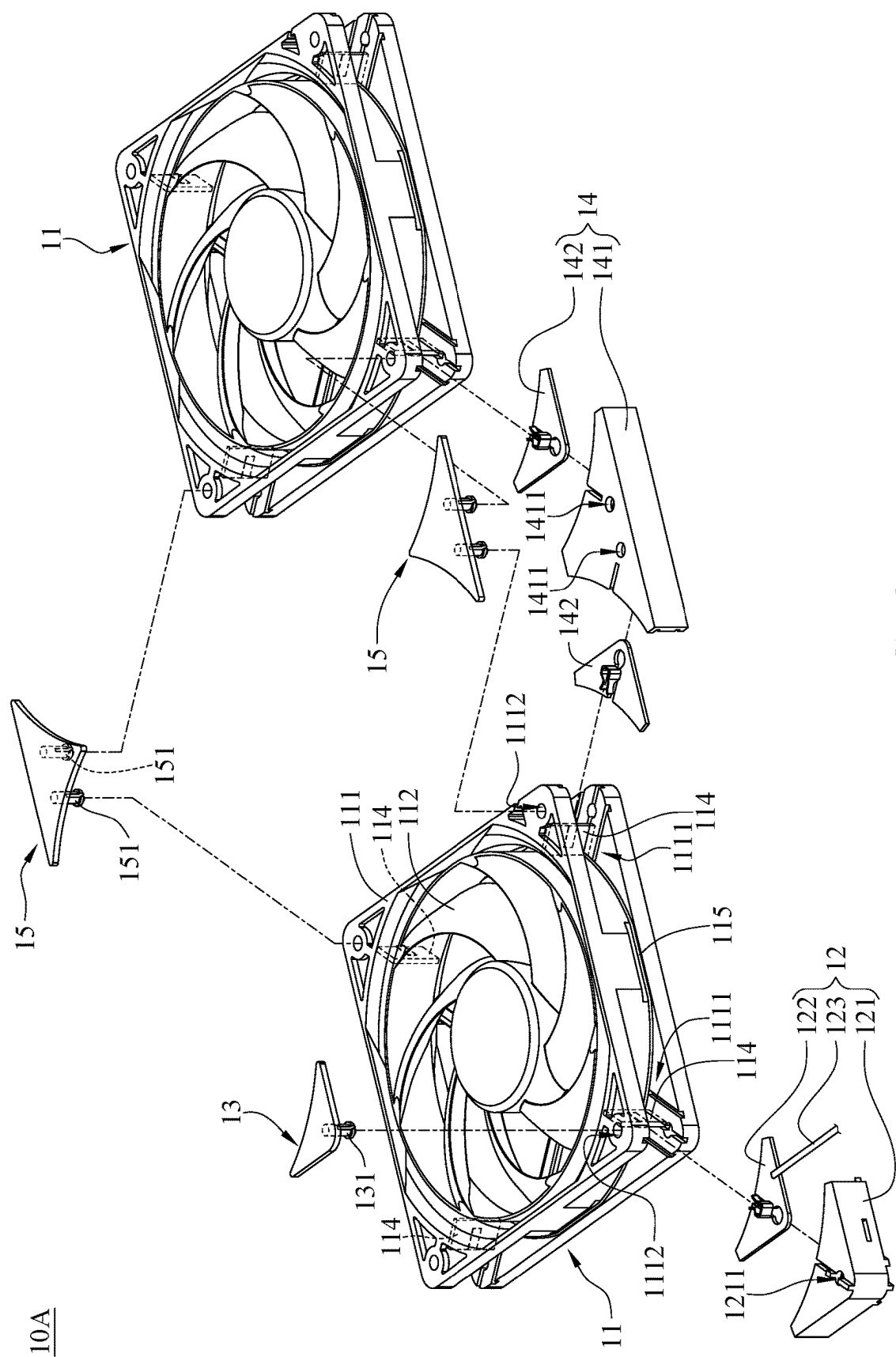


FIG. 8

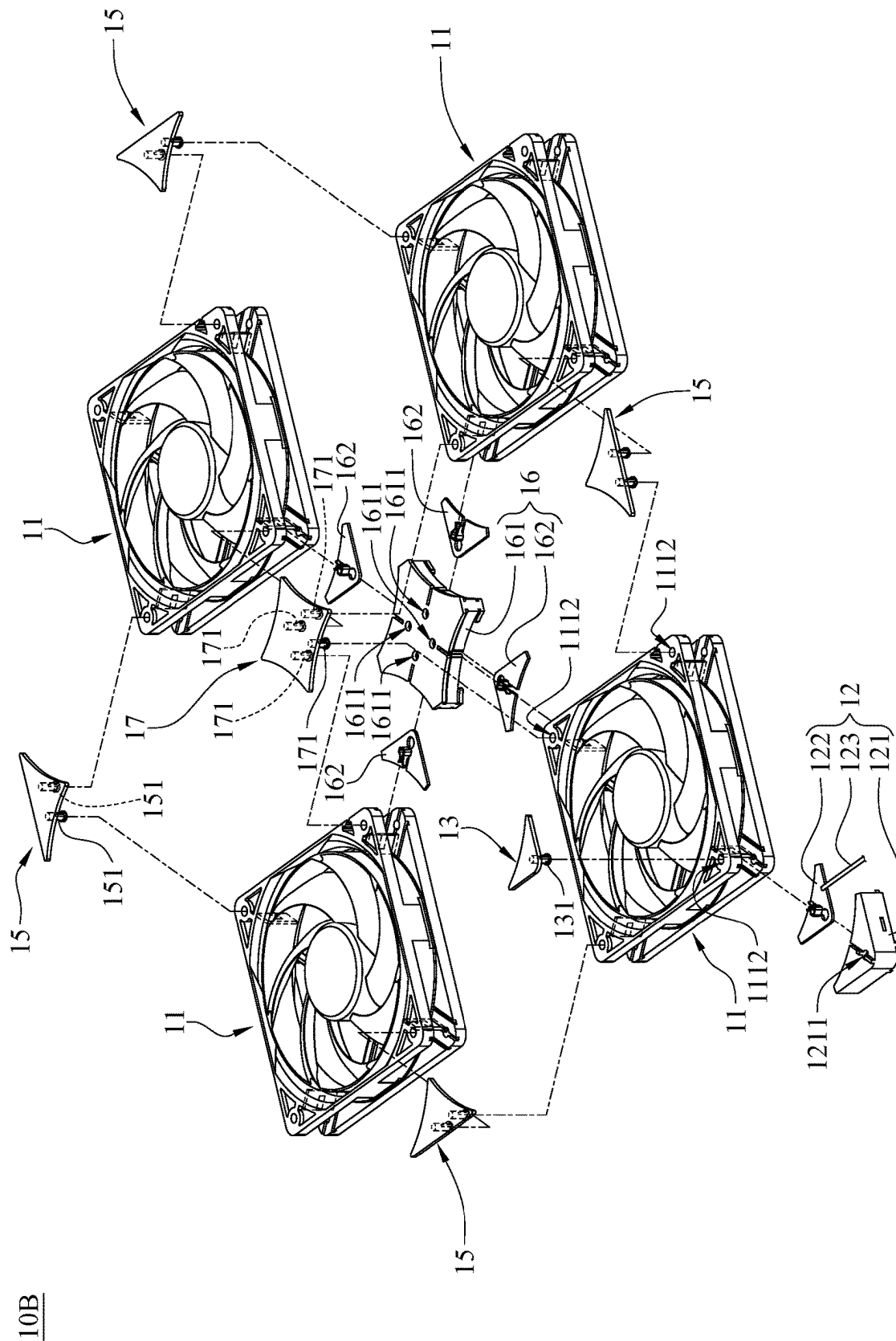


FIG. 10

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FAN ASSEMBLY**CROSS-REFERENCE TO RELATED APPLICATIONS**

This non-provisional application claims priority under 35 U.S.C. § 119(a) on Patent Application No(s). 202310101511.1 filed in China, on Feb. 10, 2023, the entire contents of which are hereby incorporated by reference.

TECHNICAL FIELD

The present disclosure relates to a fan assembly, more particularly to a fan assembly having an attachment device.

BACKGROUND

With the rapid development of technology, the computation performance of processors of an electronic product has also improved significantly, while a large amount of heat has been generated at the same time. In order to ensure that the processors will not be damaged due to high temperature, a fan is generally provided in the electronic product to cool the processors, so that the processors can operate within an adequate temperature range.

The quantity of the fans may be selected according to a heat dissipation requirement of the processors of the electronic product. However, when multiple fans are adopted, an inner space of a casing of the electronic product needs to accommodate not only the fans but also cables provided with the fans, causing the fans to be difficult to be mounted in the casing. Therefore, how to accommodate the fans in the casing of the electronic product is an important issue to be solved.

SUMMARY

The present disclosure provides a fan assembly capable of being accommodated in the casing of the electronic product.

One embodiment of the disclosure provides a fan assembly including at least one fan device and a first attachment device. The at least one fan device includes a frame, an impeller, a driving component and at least one in-built electrical port. The impeller is rotatably disposed at the frame. The driving component is configured to drive the impeller to rotate relative to the frame. The at least one in-built electrical port is disposed at the frame and electrically connected to the driving component. The first attachment device includes a first casing, a first external electrical port and a terminal cable. The first casing is detachably mounted at the frame. The first external electrical port is disposed at the first casing and detachably assembled with the at least one in-built electrical port. An end of the terminal cable is electrically connected to the first external electrical port.

According to the fan assembly as described in the above embodiments, the first attachment device can be detachably mounted at the fan device, such that when multiple fans are desired to be accommodated in a casing, the first attachment device is required to be merely mounted at corresponding one corner of one of the fan devices so as to provide power and control signals to all of the fan devices. Therefore, the quantity of the terminal cable can be reduced, so that the fan assembly can be easily accommodated in a casing.

BRIEF DESCRIPTION OF THE DRAWINGS

The present disclosure will become more fully understood from the detailed description given hereinbelow and the

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accompanying drawings which are given by way of illustration only and thus are not limitative of the present disclosure and wherein:

FIG. 1 is a perspective view of a fan assembly in accordance with a first embodiment of the disclosure;

FIG. 2 is an exploded view of the fan assembly in FIG. 1;

FIG. 3 is a cross-sectional view of the fan assembly in FIG. 1;

FIG. 4 is a partial perspective view of the fan assembly in FIG. 1;

FIG. 5 is a perspective view showing that a first attachment device is mounted at the fan device in FIG. 1;

FIG. 6 is a perspective view showing that a single fastener is mounted at the fan device in FIG. 1;

FIG. 7 is a perspective view of a fan assembly in accordance with a second embodiment of the disclosure;

FIG. 8 is an exploded view of the fan assembly in FIG. 7;

FIG. 9 is a perspective view of a fan assembly in accordance with a third embodiment of the disclosure; and

FIG. 10 is an exploded view of the fan assembly in FIG. 9.

DETAILED DESCRIPTION

In the following detailed description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the disclosed embodiments. It will be apparent, however, that one or more embodiments may be practiced without these specific details. In other instances, well-known structures and devices are schematically shown in order to simplify the drawing.

In addition, the terms used in the present disclosure, such as technical and scientific terms, have its own meanings and can be comprehended by those skilled in the art, unless the terms are additionally defined in the present disclosure. That is, the terms used in the following paragraphs should be read on the meaning commonly used in the related fields and will not be overly explained, unless the terms have a specific meaning in the present disclosure.

Please refer to FIG. 1 to FIG. 4, where FIG. 1 is a perspective view of a fan assembly 10 in accordance with a first embodiment of the disclosure, FIG. 2 is an exploded view of the fan assembly 10 in FIG. 1, FIG. 3 is a cross-sectional view of the fan assembly 10 in FIG. 1, and FIG. 4 is a partial perspective view of the fan assembly 10 in FIG. 1.

In this embodiment, the fan assembly 10 includes a fan device 11, a first attachment device 12 and a single fastener 13. The fan device 11 includes a frame 111, an impeller 112, a driving component 113, four in-built electrical ports 114 and a connection cable 115. Each of four corners of the frame 111 has an installation space 1111. The impeller 112 is rotatably disposed at the frame 111. The driving component 113 includes a stator (not shown) and a rotor (not shown). The stator and a rotor are, for example, magnets or coils matched with each other. The stator is fixed on the frame 111. The rotor is rotatable relative to the stator via an electromagnetic effect therebetween. The driving component 113 is configured to drive the impeller 112 to rotate relative to the frame 111. The four in-built electrical ports 114 are, for example, circuit boards having conductive metal pads. The four in-built electrical ports 114 are, for example, disposed in the four installation spaces 1111 of the frame 111, respectively, and the four in-built electrical ports 114 are electrically connected to the driving component 113 via the connection cable 115.

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The first attachment device **12** includes a first casing **121**, a first external electrical port **122** and a terminal cable **123**. The first casing **121** is detachably mounted in one of the installation spaces **1111** of the frame **111**. The first external electrical port **122** is, for example, a circuit board having a conductive metal clip. The first external electrical port **122** is disposed in the first casing **121**, and is detachably assembled with one of the in-built electrical ports **114**. An end of the terminal cable **123** is electrically connected to the first external electrical port **122**, and another end of the terminal cable **123** is electrically connected to an external power source (not shown). That is, the fan device **11** can receive a power or control signals via the first attachment device **12**.

In this embodiment, the first casing **121** of the first attachment device **12** is mounted in one of the installation spaces **1111** of the frame **111**, such that the first casing **121** can be entirely fitted in the frame **111** without protruding from the frame **111**. Therefore, a space occupied by the fan assembly **10** can be reduced.

In addition, the frame **111** has a plurality of through holes **1112**. The first casing **121** of the first attachment device **12** has a first insertion hole **1211**. The single fastener **13** has an engagement protrusion **131**. The engagement protrusion **131** is disposed through one of the through holes **1112** of the frame **111** and the first insertion hole **1211** of the first casing **121** so as to fix the first casing **121** in the frame **111**. That is, the first attachment device **12** is fixed in the frame **111** via the single fastener **13**.

In this embodiment, all of the four in-built electrical ports **114** are electrically connected to the driving component **113** via the connection cable **115**. As a result, the first attachment device **12** can be mounted in any one of the installation spaces **1111** of the fan device **11** for electrically connecting the in-built electrical port **114** in such installation space **1111** with the first external electrical port **122**, such that the power or the control signals can be provided to the fan device **11** for driving the fan device **11**.

Please refer to FIG. 5 and FIG. 6, where FIG. 5 is a perspective view showing that the first attachment device **12** is mounted at the fan device **11** in FIG. 1, and FIG. 6 is a perspective view showing that the single fastener **13** is mounted at the fan device **11** in FIG. 1.

In this embodiment, during the installation of the first attachment device **12** into the frame **111**, the first step is to place the first attachment device **12** into one of the installation spaces **1111** of the frame **111** along a direction A, such that the first external electrical port **122** of the first attachment device **12** is assembled with the in-built electrical port **114** located in this installation space **1111**. Then, the second step is to insert the engagement protrusion **131** of the single fastener **13** through the through hole **1112** connected to this installation space **1111** and into the first insertion hole **1211** of the first casing **121** of the first attachment device **12** so as to fix the first casing **121** of the first attachment device **12** in the frame **111**. Then, the third step is to connect the terminal cable **123** of the first attachment device **12** with the external power source. Accordingly, the power or the control signals can be transmitted to the fan device **11** via the terminal cable **123** and the first external electrical port **122** of the first attachment device **12** so as to drive the fan device **11** to operate.

Please refer to FIG. 7 and FIG. 8, where FIG. 7 is a perspective view of a fan assembly **10A** in accordance with a second embodiment of the disclosure, and FIG. 8 is an exploded view of the fan assembly **10A** in FIG. 7.

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The fan assembly **10A** of this embodiment is similar to the fan assembly **10** of the first embodiment, the main difference between them will be described below, and the same parts between them can be referred to the aforementioned paragraphs with the reference to FIG. 1 to FIG. 6 and will not be repeatedly introduced hereinafter. In this embodiment, the fan assembly **10A** includes two fan devices **11**, a first attachment device **12**, a second attachment device **14** and two double fasteners **15**. The fan devices **11** are arranged side by side. The first attachment device **12** is mounted in one of the installation spaces **1111** of one of the fan devices **11** located farther away from the other fan devices, and transmits the power or the control signals to the fan devices **11** via electrical connection between the external power source and the first attachment device **12**. The second attachment device **14** includes a second casing **141** and two second external electrical ports **142**. The second casing **141** is detachably mounted in two installation spaces **1111** of the frames **111** of the fan devices **11** located adjacent to each other, such that the second casing **141** is located at one side of the two fan devices **11** connected to each other. The two second external electrical ports **142** are, for example, circuit boards having conductive metal clips. The two second external electrical ports **142** are detachably assembled with two of the in-built electrical ports **114** in the two installation spaces **1111** of the frames **111**, respectively, and the two second external electrical ports **142** are connected to each other via, for example, a connection cable (not shown). Accordingly, after the first attachment device **12** receives the power or the control signals and transmits it or them to one of the fan devices **11**, the two second external electrical ports **142** transmit the power or the control signals to the other fan device **11**, thereby driving the two fan devices **11** to operate simultaneously.

In this embodiment, the first attachment device **12** and the second attachment device **14** are entirely fitted into the installation spaces **1111** located at some corners of the frames **111** without protruding from the frames **111**. Therefore, when the fan devices **11** are arranged side by side, the frames **111** can be arranged as close as possible without being interfered by the first attachment device **12** and the second attachment device **14**, thereby reducing an overall size of the fan devices **11** arranged side by side.

The two double fasteners **15** are engaged with different sides of the two frames **111**, respectively. Each double fastener **15** has two engagement protrusions **151**. The second casing **141** has two second insertion holes **1411**. The two engagement protrusions **151** of one of the double fasteners **15** are disposed through two of the through holes **1112** located on one side of the two frames **111** and the two second insertion holes **1411** of the second casing **141**, respectively, so as to fix the second casing **141** in the two frames **111**. The two engagement protrusions **151** of the other double fastener **15** are disposed through two of the through holes **1112** located on another side of the two frames **111**. Accordingly, the two double fasteners **15** not only fix the second attachment device in the two frames **111**, but also connect the two fan devices **11** more stably.

In this embodiment, the two fan devices **11** are electrically connected to each other via the two second external electrical ports **142**. As a result, the first attachment device **12** can be mounted in any one of the installation spaces **1111** of the two fan devices **11** for electrically connecting the in-built electrical port **114** in such installation space **1111** with the first external electrical port **122**, such that the power or the control signals can be provided to one of the fan devices **11** for driving the two fan devices **11**.

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In this embodiment, the second attachment device **14** includes only one second casing **141**, but the disclosure is not limited thereto. In other embodiments, the second attachment device may include two second casings, and the two second casings are mounted in the two installation spaces of the frames of the fan devices located adjacent to each other.

In this embodiment, the second attachment device **14** includes two second external electrical ports **142**, but the disclosure is not limited thereto. In other embodiments, the second attachment device may include only one second external electrical port integrally formed as a single piece.

Please refer to FIG. 9 and FIG. 10, where FIG. 9 is a perspective view of a fan assembly **10B** in accordance with a third embodiment of the disclosure, and FIG. 10 is an exploded view of the fan assembly **10B** in FIG. 9.

The fan assembly **10B** of this embodiment is similar to the fan assembly **10** of the first embodiment, the main difference between them will be described below, and the same parts between them can be referred to the aforementioned paragraphs with the reference to FIG. 1 to FIG. 6 and will not be repeatedly introduced hereinafter. In this embodiment, the fan assembly **10B** includes four fan devices **11**, a first attachment device **12**, a third attachment device **16**, a quadruple fastener **17** and four double fasteners **15**. The four fan devices **11** are, for example, arranged in 2×2 array. The first attachment device **12** is mounted in one of the installation spaces **1111** located at one corner of the fan devices **11**, and transmits the power or the control signals to the fan devices **11** via electrical connection between the external power source and the first attachment device **12**. The third attachment device **16** includes a third casing **161** and four third external electrical ports **162**. The third casing **161** of the third attachment device **16** is detachably mounted in four installation spaces **1111** of the four frames **111** of the fan devices **11** located adjacent to one another. The four third external electrical ports **162** are, for example, circuit boards having conductive metal clips. The four third external electrical ports **162** are detachably assembled with four of the in-built electrical ports **114** located in the four installation spaces **1111** of the four frames **111**, and the four third external electrical ports **162** are electrically connected to each other via, for example, a connection cable (not shown). Accordingly, after the first attachment device **12** receives the power or the control signals and transmits it or them to one of the fan devices **11**, the four third external electrical ports **162** transmit the power or the control signals to the other fan device **11**, thereby driving the four fan devices **11** to operate simultaneously.

In this embodiment, the first attachment device **12** and the third attachment device **16** are fitted into the installation spaces **1111** located at some corners of the four frames **111** without protruding from the frames **111**. Therefore, when the fan devices **11** are arranged side by side, the frames **111** can be arranged as close as possible without being interfered by the first attachment device **12** and the third attachment device **16**, thereby reducing an overall size of the fan devices **11** arranged side by side.

The quadruple fastener **17** has four engagement protrusions **171**. The third casing **161** has four third insertion holes **1611**. The four engagement protrusions **171** of the quadruple fastener **17** are disposed through four of the through holes **1112** connected to the four installation spaces **1111** of the four frames **111** and the four third insertion holes **1611** of the third casing **161**, respectively, so as to fix the third casing **161** in the four frames **111**. That is, the third casing **161** is fixed in the four frames **111** via the quadruple fastener **17**. The four double fasteners **15** are engaged with different sides

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of the four frames **111**, respectively. Each double fastener **15** has two engagement protrusions **151**. The two engagement protrusions **151** of each of the four double fasteners **15** are engaged with two through holes **1112** of any two adjacent frames **111**.

In addition, the four double fasteners **15** are engaged with different sides of the four frames **111**, respectively. Accordingly, the four fan devices **11** can be connected more stably via the four double fasteners **15**.

In this embodiment, the four fan devices **11** are electrically connected to each other via the four third external electrical ports **162**. As a result, the first attachment device **12** can be mounted in any one of the installation spaces **1111** of the four fan devices **11** for electrically connecting the in-built electrical port **114** in such installation space **1111** with the first external electrical port **122**, such that the power or the control signals can be provided to one of the fan devices **11** for driving the four fan devices **11**.

In this embodiment, the third attachment device **16** includes four third external electrical ports **162**, but the disclosure is not limited thereto. In other embodiments, the third attachment device may include only one third external electrical port integrally formed as a single piece.

In this embodiment, the fan assembly **10**, **10A** and **10B** includes one, two and four fan device(s) **11**, respectively, and the two or four fan devices can be connected to each other via the double fasteners **15** or the quadruple fastener **17**, but the disclosure is not limited thereto. In other embodiments, the fan assembly may include more than four fan devices, and the fan devices can be connected to each other via the double fasteners or the quadruple fasteners.

According to the fan assembly as described in the above embodiments, the first attachment device can be detachably mounted at the fan device, such that when multiple fans are desired to be accommodated in a casing, the first attachment device is required to be merely mounted at corresponding one corner of one of the fan devices so as to provide power and control signals to all of the fan devices. Therefore, the quantity of the terminal cable can be reduced, so that the fan assembly can be easily accommodated in a casing.

In addition, when the fan devices are assembled with each other according to heat dissipation requirement of an electronic product, the first attachment device can be mounted at one of the fan devices and the second attachment device or the third attachment device can be mounted between the fan devices, and the fan devices are electrically connected to each other via the second attachment device or the third attachment device. Accordingly, one of the fan devices can receive the external power or the control signals via the first attachment device, and the second attachment device or the third attachment device can transmit the power or the control signals to the other fan devices. Therefore, the power and the control signals are provided to all the fan devices via only one external cable without connecting a multiple cables to occupy space.

In addition, the first attachment device, the second attachment device and the third attachment device are fitted into the installation spaces located at some corners of the frames without protruding from the frames. Therefore, when the fan devices are arranged side by side, the frames can be arranged as close as possible without being interfered by the attachment devices, thereby reducing an overall size of the fan devices arranged side by side.

It will be apparent to those skilled in the art that various modifications and variations can be made to the present disclosure. It is intended that the specification and examples

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be considered as exemplary embodiments only, with a scope of the disclosure being indicated by the following claims.

What is claimed is:

1. A fan assembly, comprising:

at least one fan device, comprising:

a frame;

an impeller, rotatably disposed at the frame;

a driving component, configured to drive the impeller to rotate relative to the frame; and

at least one in-built electrical port, disposed at the frame and electrically connected to the driving component; and

a first attachment device, comprising:

a first casing, detachably mounted at the frame;

a first external electrical port, disposed at the first casing and detachably assembled with the at least one in-built electrical port;

a terminal cable, wherein an end of the terminal cable is electrically connected to the first external electrical port; and

a single fastener, wherein the frame has a plurality of through holes, the first casing has a first insertion hole, the single fastener is disposed through one of the plurality of through holes of the frame and the first insertion hole of the first casing to fix the first casing to the frame;

wherein the at least one fan device further comprises a connection cable, the at least one fan device in-built electric port comprises a plurality of in-built electrical ports, the plurality of in-built electrical ports are disposed on different sides of the frame, respectively, and the plurality of in-built electrical ports are electrically connected to the driving component via the connection cable.

2. The fan assembly according to claim 1, further comprising at least one second attachment device, wherein the at least one second attachment device comprises a second casing and two second external electrical ports, the at least one fan device of the fan assembly comprises two fan devices, the second casing of the at least one second attachment device is detachably mounted at the two frames of the two fan devices, and each of the two second external electrical ports is detachably assembled with a respective one of the plurality of in-built electrical ports in each of the two fan devices, respectively.

3. The fan assembly according to claim 2, further comprising at least one double fastener, wherein the at least one double fastener has two engagement protrusions, a second

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fan frame of the second fan of the two fan devices has a plurality of through holes, the second casing has two second insertion holes, the two engagement protrusions of the at least one double fastener are disposed through two of the plurality of through holes of the two frames of the two fan devices and the two second insertion holes of the second casing, respectively, to fix the second casing to the two frames of the two fan devices.

4. The fan assembly according to claim 3, wherein the fan assembly comprises two double fasteners, and the two double fasteners are engaged with different sides of the two frames of the two fan devices, respectively.

5. The fan assembly according to claim 1, further comprising at least one third attachment device, wherein the at least one third attachment device comprises a third casing and four third external electrical ports, the at least one fan device of the fan assembly comprises four fan devices, the third casing of the at least one third attachment device is detachably mounted at the four frames of the four fan devices, and each of the four third external electrical ports is detachably assembled with a respective one of the plurality of in-built electrical ports in each of the four fan devices, respectively.

6. The fan assembly according to claim 5, further comprising a quadruple fastener, wherein the quadruple fastener has four engagement protrusions, a second frame of the second fan a third frame of the third fan and a fourth frame of the fourth fan of the four fan devices each have a plurality of through holes, the third casing has four third insertion holes, the four engagement protrusions of the quadruple fastener are disposed through four of the plurality of through holes of the four frames of the four fan devices and the four third insertion holes of the third casing, respectively, to fix the third casing to the four frames.

7. The fan assembly according to claim 6, further comprising a double fastener, wherein the double fastener has two engagement protrusions, the two engagement protrusions of the double fastener are engaged with two of the plurality of through holes of any adjacent two of the four frames of the four fan devices, respectively.

8. The fan assembly according to claim 1, wherein the at least one in-built electrical port comprises a circuit board having a conductive metal pad, and the first external electrical port is a circuit board having a conductive metal clip.

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