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(54) **Title:** THERMOSTAT SUITABLE FOR INDOOR WALL-MOUNTING

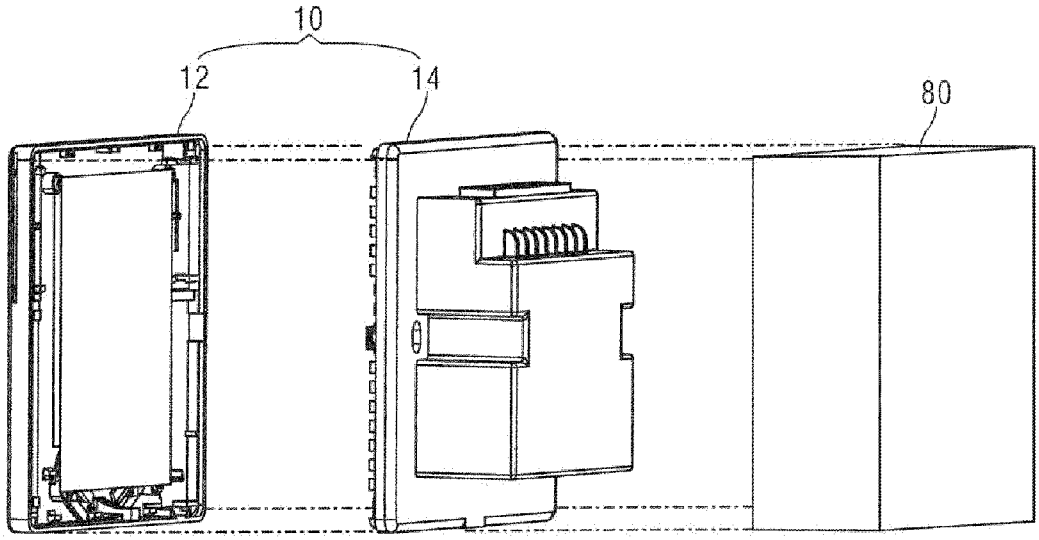


Fig. 1

(57) **Abstract:** A thermostat suitable for indoor wall-mounting. The present disclosure provides an indoor wall-mounted thermostat, comprising: a mounting member (24), suitable for being fixed to a wall-mounted box (80), the wall-mounted box (80) being suitable for being embedded in a wall; and a main module (22), having a housing, and a display panel (223), a control circuit board, and a power supply all disposed in the housing, and the housing being suitable for being mounted on the mounting member (24). An operator does not need to perform secondary assembly for the thermostat during mounting, and a circuit board in the thermostat is not exposed.

WO 2018/197667 A1

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Description

THERMOSTAT SUITABLE FOR INDOOR WALL-MOUNTING

Technical field

The present disclosure generally relates to the field of heating, ventilation, and air conditioning (HVAC), and in particular, to an indoor wall-mounted thermostat, thermostat for short, in a heating and ventilation system.

Background art

In a heating, ventilating and air conditioning system in a building, a thermostat is usually placed indoors and used to sense the indoor temperature and uses closed loop control to keep the indoor temperature at a desired temperature set point of a user.

Fig. 1 exemplarily shows a schematic of a structure of an existing indoor wall-mounted thermostat. As shown in Fig. 1, a thermostat 10 is suitable for being mounted on a wall-mounted box 80. The wall-mounted box 80 is usually embedded in advance in an open hole in a wall, and a power cord extending from the inside of the open hole passes through the open hole in the wall-mounted box 80 and is connected to the thermostat 10. The thermostat 10 comprises a display panel 12 and a power module 14. The display panel 12 and the power module 14 may be buckled with each other. To mount the thermostat shown in Fig. 1, the power module 14 is usually mounted in the wall-mounted box 80 first, the power cord is connected to the power module 14, and the display panel 12 is then buckled on the power module 14.

For such a thermostat shown in Fig. 1, an installer needs to complete the secondary assembly work of the thermostat during mounting. Moreover, as shown in Fig. 1, before buckling, a circuit board arranged in the display panel 12 is exposed to

air. The installer may contact the circuit board in the display panel 12.

Summary of the Disclosure

One objective of the present disclosure is to provide a thermostat for indoor wall-mounting, which can inhibit a circuit board from being damaged and facilitate mounting by an installer.

According to an embodiment of the present disclosure, the present disclosure provides an indoor wall-mounted thermostat, comprising: a mounting member, suitable for being fixed on a wall-mounted box, the wall-mounted box being suitable for being embedded in a wall; and a main module, comprising a housing, and a display panel, a control circuit board and a power supply all disposed in the housing, and the housing being suitable for being mounted on the mounting member. Preferably, the mounting member and the housing of the main module are engaged and connected with each other.

In the thermostat provided in the present disclosure, all functional components (for example, a display panel, a control circuit board, and a power supply) are integrated in a main module. The main module is connected to a wall box through a mounting member that can be mounted in advance in the wall box. Therefore, an operator does not need to perform secondary assembly of the thermostat, and a circuit board in the thermostat is not exposed before being mounted.

Preferably, at least one limiting portion and at least one clamping portion are disposed on a surface, facing the main module, of the mounting member. The main module has a housing, the display panel, the control circuit board, and the power supply are placed in the housing, and an engagement portion fitting the limiting portion and the clamping portion is disposed on the housing. Preferably, the clamping portion on

the mounting member is a clamping hook. More preferably, the housing comprises a front housing and a rear housing, and an opening on the front housing and an opening on the rear housing fit each other to form a clamping groove suitable for being engaged with the clamping portion.

In the thermostat provided in the present disclosure, a clamping hook and a clamping groove are used to implement locking. Such a connection manner is simple, and detachment is easy. Because the clamping hook and the clamping groove fit each other, during the detachment of a main module, unnecessary damages are not caused to a structure on a housing of the main module or a structure on a mounting member. Therefore, the thermostat of the present disclosure can be mounted and detached in a more stable and reliable manner.

In addition, when the thermostat of the present disclosure is used, a power cord does not need to be connected before the mounting member is mounted to a wall box. The power cord is connected during mounting of the main module and the main module is engaged on the mounting member. Compared with an earlier thermostat having discrete modules, such a mounting manner is more convenient for an operator.

In addition, when the thermostat of the present disclosure is used, circuit boards that are originally separately disposed in a display panel and a power module can be integrated in one circuit board. A connection failure between the power module and the display panel is further avoided, and costs are reduced.

Preferably, a holder is disposed on the main module and is suitable for holding a fuse device. When the thermostat provided in the present disclosure is returned to the factory for repair or maintained on site, a worker can conveniently replace a fuse device after determining that the fuse device

fails without needing to open a rear housing of the main module.

Preferably, the mounting member comprises a mounting frame facing the main module and a reinforcing plate extending along an inner edge of the mounting frame in a direction away from the main module. Preferably, the reinforcing plate is further provided with a bending portion bending towards the center of the mounting frame, the bending portion preferably bending at a right angle. More preferably, vent holes are provided on a side wall of the reinforcing plate.

When the thermostat provided in the present disclosure is used, the strength of a mounting member is effectively improved because a reinforcing plate is disposed. The strength of the mounting member can be further improved by a bending portion bending towards the center of a mounting frame on the reinforcing plate. Particularly, the strength of the mounting member can be greatly improved by using a right-angle bend. Therefore, the reinforcing plate preferably generally forms a box body with a hollow rear surface. The corners of the box body formed by the reinforcing plate can effectively enhance the strength. Vent holes provided on a side wall of the reinforcing plate facilitate heat dissipation and can further reduce the weight and material costs of the mounting member.

Preferred embodiments are described below with reference to the accompanying drawings in an explicit and comprehensible manner, and the foregoing characteristics, technical features, advantages, and implementation manners thereof are further described.

Brief description of the drawings

The following accompanying drawings are only to illustratively describe and explain the present disclosure and not intended to limit the scope of the present disclosure.

Fig. 1 shows a schematic structure of an existing indoor wall-mounted thermostat.

Fig. 2 is an exploded view of a thermostat according to an embodiment of the present disclosure.

Fig. 3 shows the structure of a housing of a thermostat according to an embodiment of the present disclosure.

Fig. 4 shows a locking structure between a mounting member and a main module according to an embodiment of the present disclosure.

Fig. 5 is a rear view of a mounting member according to an embodiment of the present disclosure.

Reference signs in the drawings:

10: Thermostat; 12: Display panel; 14: Power module; 80: Wall-mounted box; 20: Thermostat; 22: Main module; 24: Mounting member; 82: Screw hole; 223: Display panel; 221: Front housing; 222: Rear housing; 241: Mounting frame; 245: Reinforcing plate; 242: Mounting hole; 244: Limiting portion; 246: Clamping portion; 23: Fuse device

Detailed Description of the Drawings

For better understanding of the technical features, objects and effects of the present disclosure, the particular embodiments of the present disclosure will now be described herein with reference to the accompanying drawings, and the same numerals denote the components having the same or similar structure while having the same function throughout the drawings.

The word “illustrative” represents “acting as an instance, example or description” herein, and any graphical

representation and implementation method described as "illustrative" herein should not be construed as a more preferable or more advantageous technical solution.

For clarity of the drawings, only the relevant parts of the present disclosure are schematically showed throughout the drawings, and they do not represent the actual structure of a product. In addition, in order to make the figures concise and easy to be understood, in some figures, there are components of the same structure or function, and only one therein is drawn illustratively or only one therein is marked.

The word "a" does not merely represent "only one" herein, but may also represent the case of "more than one". In addition, the words "first", "second", etc. herein are merely used for distinguishing each other rather than representing the degree of importance and order, etc. thereof.

Fig. 2 shows a schematic structure of a thermostat according to an embodiment of the present disclosure. As shown in Fig. 2, a thermostat 20 comprises a main module 22 and a mounting member 24. The mounting member 24 is suitable for being fixed on a wall-mounted box 80. For example, a screw may pass through a mounting hole 242 to be fixed in a screw hole 82 of the wall-mounted box 80. The main module 22 is integrated with a display panel 223, a control circuit board (not shown), and a power supply (not shown). The main module 22 is suitable for being mounted on the mounting member 24.

Preferably, in the example shown in Fig. 2, the main module 22 and the mounting member 24 are engaged and connected with each other and fixed. Specifically, in the example shown in Fig. 2, two pairs of limiting portions 244 and clamping portions 246 are disposed on a surface, facing the main module 22, of the mounting member 24. The limiting portions 244 and the clamping portions 246 are aligned with and separated from each other in a vertical direction. In the example in Fig. 2, the limiting

portion 244 is located on an upper edge of the mounting member 24. The clamping portion 246 is located on a lower edge of the mounting member 24. The two pairs of limiting portions and clamping portions are disposed separately from each other in a horizontal direction. When the main module 22 is mounted on the mounting member 24, the limiting portion 244 is used to limit the position of the main module 22, and at the same time the main module 22 can be hung on the limiting portion 244. The clamping portion 246 is preferably a clamping hook, and can extend into an engagement portion in a corresponding position of the main module 22 and can be engaged with and fixed to the main module. Optionally, only one pair of a limiting portion 244 and a clamping portion 246 having relatively large transverse sizes may further be disposed in a central line position of the mounting member 24. Optionally, the limiting portion 244 and the clamping portion 246 shown in Fig. 2 may further be disposed in two opposite edge positions in the horizontal direction. Moreover, the quantities of the limiting portion 244 and the clamping portion 246 may be determined according to a requirement.

Fig. 3 exemplarily shows a structure of the main module 22. As shown in Fig. 3, the main module 22 has a housing. The housing specifically comprises a front housing 221 and a rear housing 222. The display panel 223, the control circuit board, and the power supply (not shown) are all placed in the front housing 221. The rear housing 222 is used as a rear cover and embedded in a side wall of the front housing 221 and becomes fixed. In the example shown in Fig. 3, engagement portions or clamping grooves is respectively disposed on both an upper edge position and a lower edge position of the housing. A clamping groove 221a located on the upper edge and the limiting portion 244 on the mounting member 24 fit each other and are positioned. A clamping groove 222b located on a lower edge and the clamping portion 246 on the mounting member 24 are engaged and connected with each other. Fig. 4 is an exemplary sectional view when the clamping portion 246 of the mounting member 24 and the main

module 22 are engaged and connected with each other. As shown in Fig. 4, the clamping portion 246 is a clamping hook, and extends into the clamping groove 222b located below the rear housing 222. A hook portion of the clamping portion is clamped at an opening 221b located on a lower surface of the front housing 221, so as to implement locking. During detachment, an operator only needs to place a tool into an opening 221b below the main module 22 to pry the clamping hook, so as to conveniently detach the main module 22 from the mounting member 24.

Fig. 5 is an exemplary rear view of the mounting member 24. With reference to Fig. 2 and Fig. 5, the mounting member 24 specifically comprises a mounting frame 241 and a reinforcing plate 245 extending along an inner edge of the mounting frame 241 in a depth direction. The mounting frame 241 has a surface facing the main module 22. The limiting portion 244 and the clamping portion 246 are disposed on the surface. The reinforcing plate 245 is used to enhance the strength of the mounting frame, and preferably extends in a depth direction away from the main module. More preferably, as shown in Fig. 5, the reinforcing plate 245 is further provided with a bending portion bending towards the center of the mounting frame 241, the bending portion preferably bending at a right angle. Therefore, as shown in Fig. 5, preferably, the reinforcing plate 245 generally forms a box body with a hollow rear surface. The corners of the box body formed by the reinforcing plate can effectively enhance the strength. More preferably, vent holes are provided on a side wall of the reinforcing plate. These vent holes facilitate heat dissipation and can further reduce the weight and material costs of the mounting member 24.

In the example in Fig. 3, a holder is further disposed on the control circuit board in the main module 22 and is suitable for holding a replaceable fuse device 23. An opening is provided on the rear housing 222 of the main module 22, and is suitable for

exposing the fuse device 23. Therefore, when the thermostat is returned to the factory for repair or maintained on site, a worker can conveniently replace a fuse device after determining that the fuse device fails without needing to open a rear housing.

It should be understood that although this description is described according to various embodiments, each of the embodiments do not only contain one independent technical solution, and such narrative style of the description is merely for the sake of clarity, and those skilled in the art should take the description as a whole and the technical solutions in the various embodiments may also be combined appropriately to form other implementations which can be understood by those skilled in the art.

The series of detailed descriptions set forth above is merely directed to specific descriptions of feasible embodiments of the present disclosure, and they are not intended to limit the scope of protection of the present disclosure; any equivalent embodiment or alteration of the present disclosure, such as a combination, removal or duplication of features made without departing from the scope of the present disclosure, shall be included within the scope of protection of the present disclosure.

Claims

1. A thermostat suitable for indoor wall-mounting, comprising:
a mounting member (24), suitable for being fixed to a wall-mounted box (80), the wall-mounted box (80) being suitable for being embedded in a wall; and
a main module (22), having a housing, and a display panel (223), a control circuit board, and a power supply all disposed in the housing, and the housing being suitable for being mounted on the mounting member (24).

2. The thermostat as claimed in claim 1, characterized in that the mounting member (24) and the housing of the main module (22) are engaged and connected with each other.

3. The thermostat as claimed in claim 2, characterized in that
at least one limiting portion (244) and at least one clamping portion (246) are disposed on a surface, facing the main module (22), of the mounting member (24), and
an engagement portion fitting the limiting portion (244) and the clamping portion (246) is disposed on the housing of the main module (22).

4. The thermostat as claimed in claim 3, characterized in that the clamping portion (246) on the mounting member (24) is a clamping hook.

5. The thermostat as claimed in claim 4, characterized in that the housing comprises a front housing (221) and a rear housing (222), and an opening (221b) on the front housing (221) and an opening (222b) on the rear housing (222) fit each other to form a clamping groove suitable for being engaged with the clamping portion (246).

6. The thermostat as claimed in any one of claims 1-5, characterized in that a holder is disposed on the main module (22) and is suitable for holding a fuse device (23).

7. The thermostat as claimed in claim 1, characterized in that the mounting member (24) comprises a mounting frame (241) facing the main module (22) and a reinforcing plate (245) extending from an inner edge of the mounting frame in a direction away from the main module.

8. The thermostat as claimed in claim 7, characterized in that the reinforcing plate (245) is further provided with a bending portion bending towards the center of the mounting frame (241).

9. The thermostat as claimed in claim 8, characterized in that vent holes are provided on a side wall of the reinforcing plate (245).

10. The thermostat as claimed in any one of claims 8-9, characterized in that the reinforcing plate (245) forms a box body, and the box body is provided with an opening in a central position on a surface away from the main module.

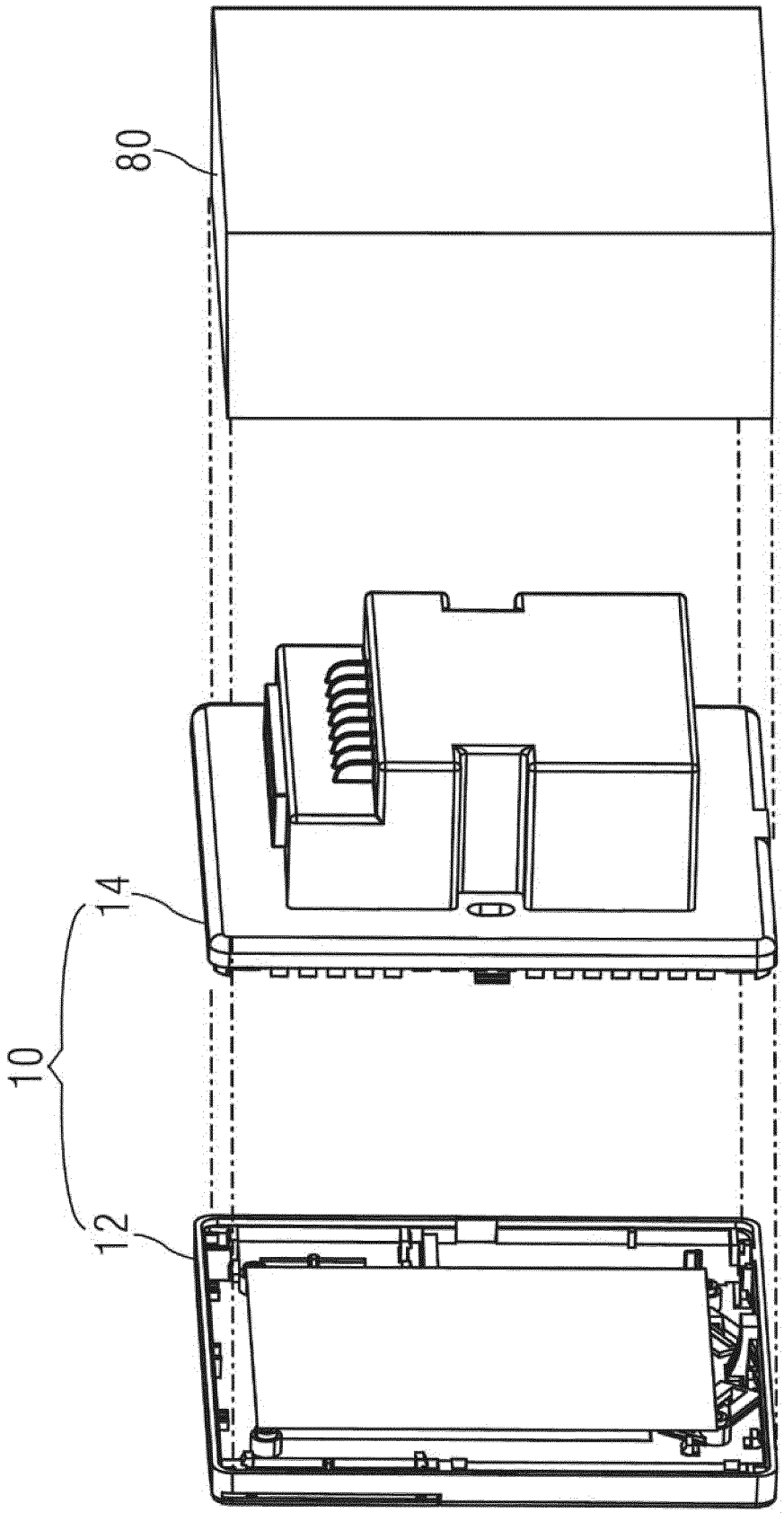


Fig. 1

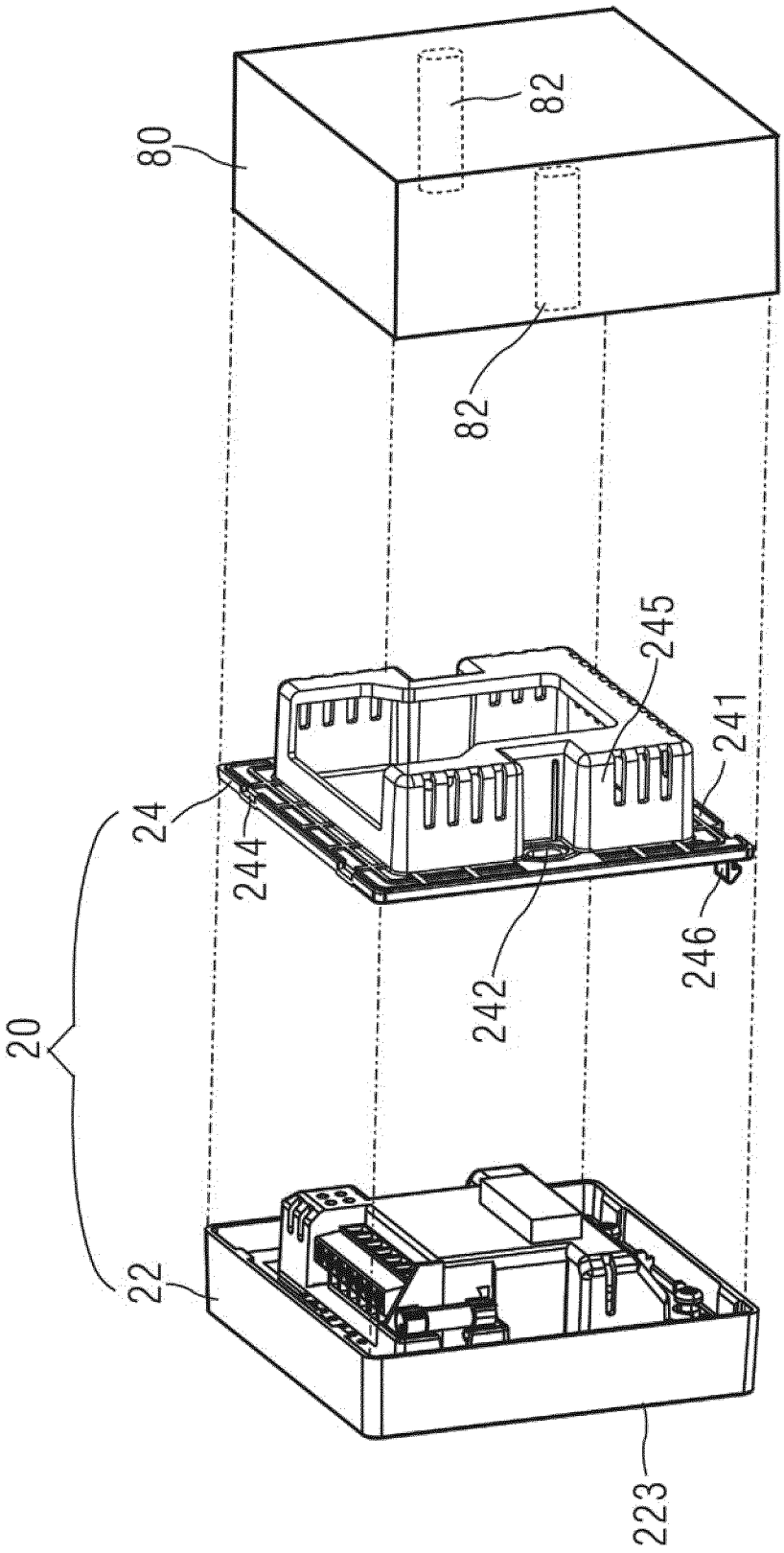


Fig. 2

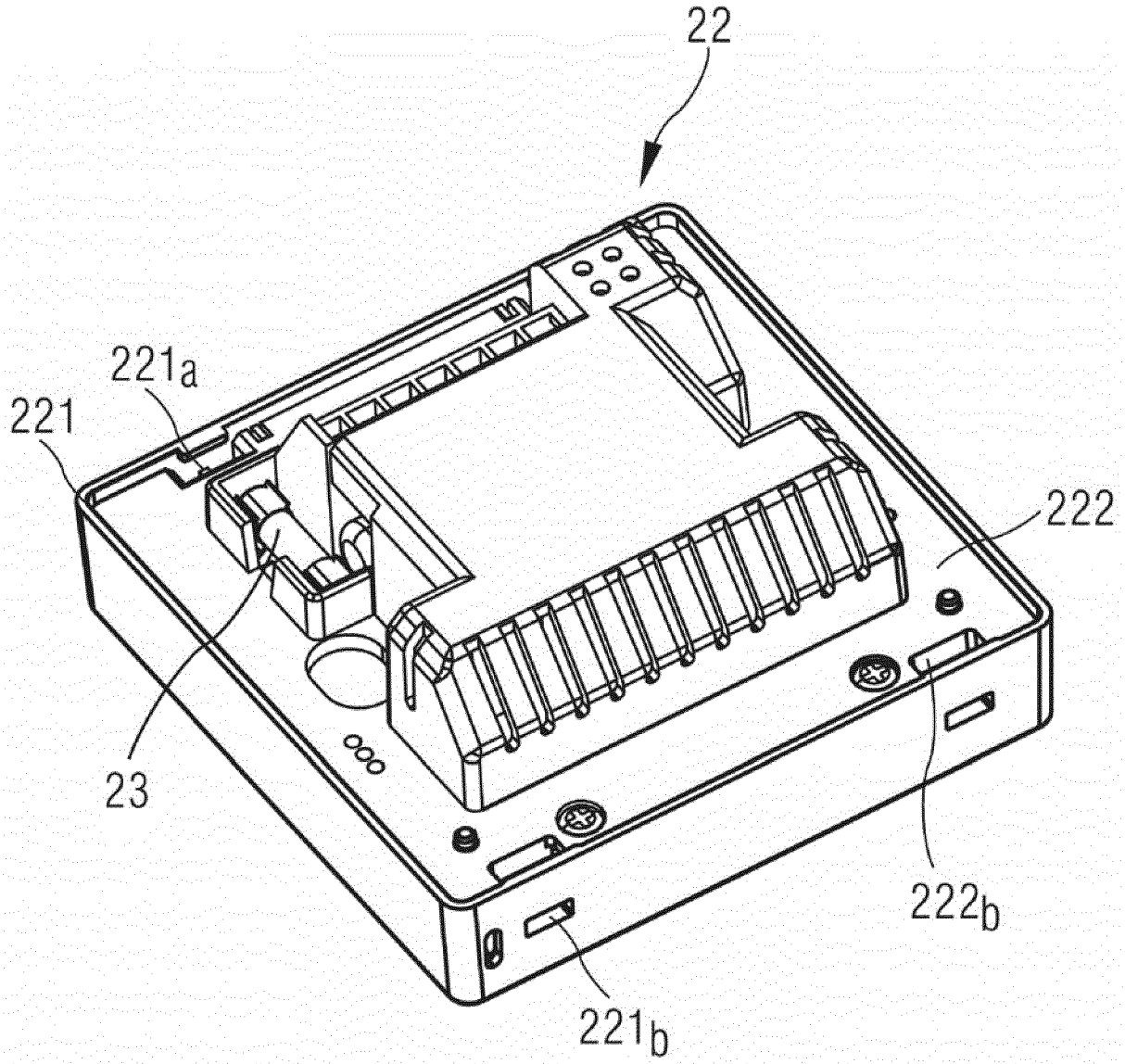


Fig. 3

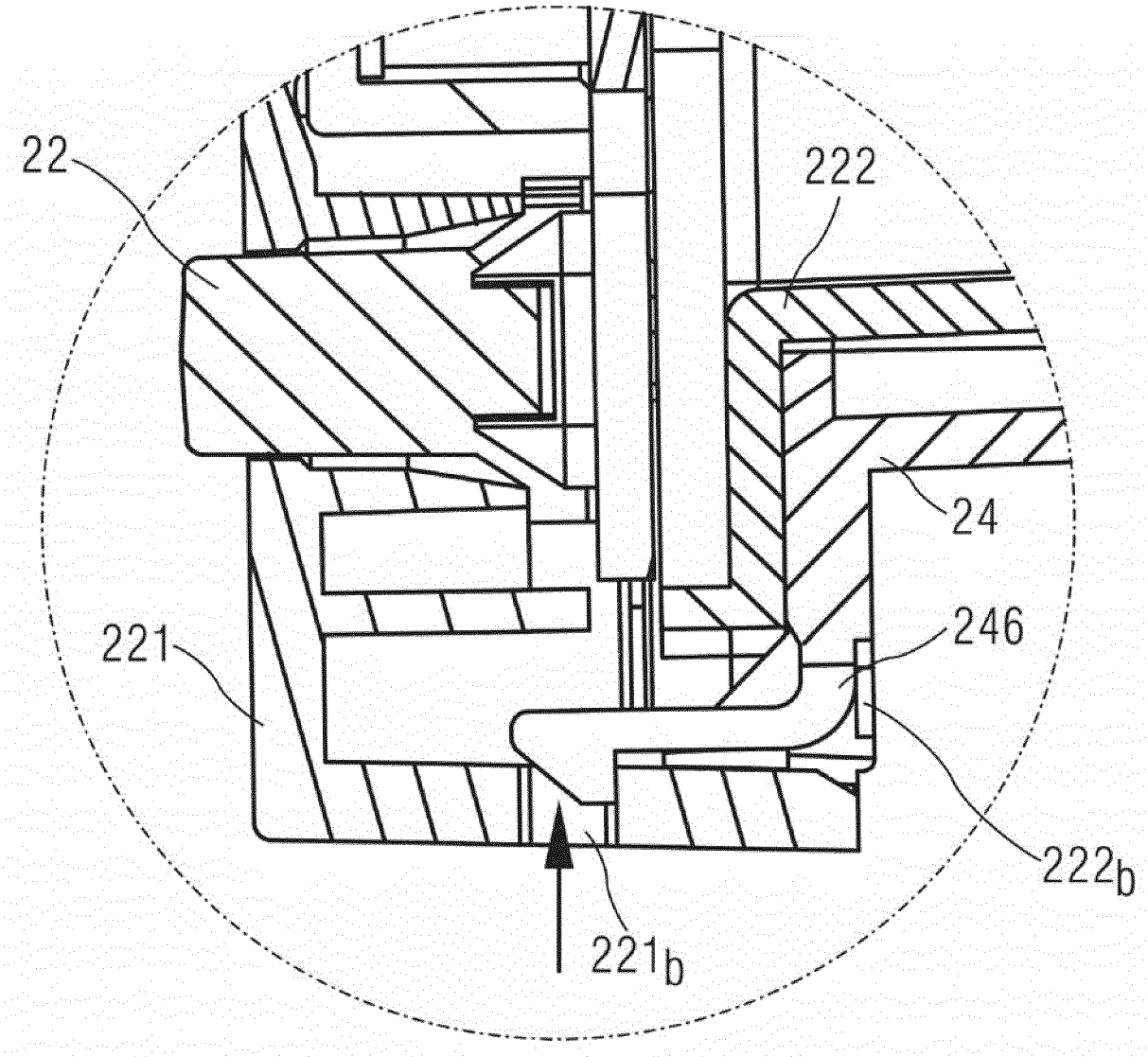


Fig. 4

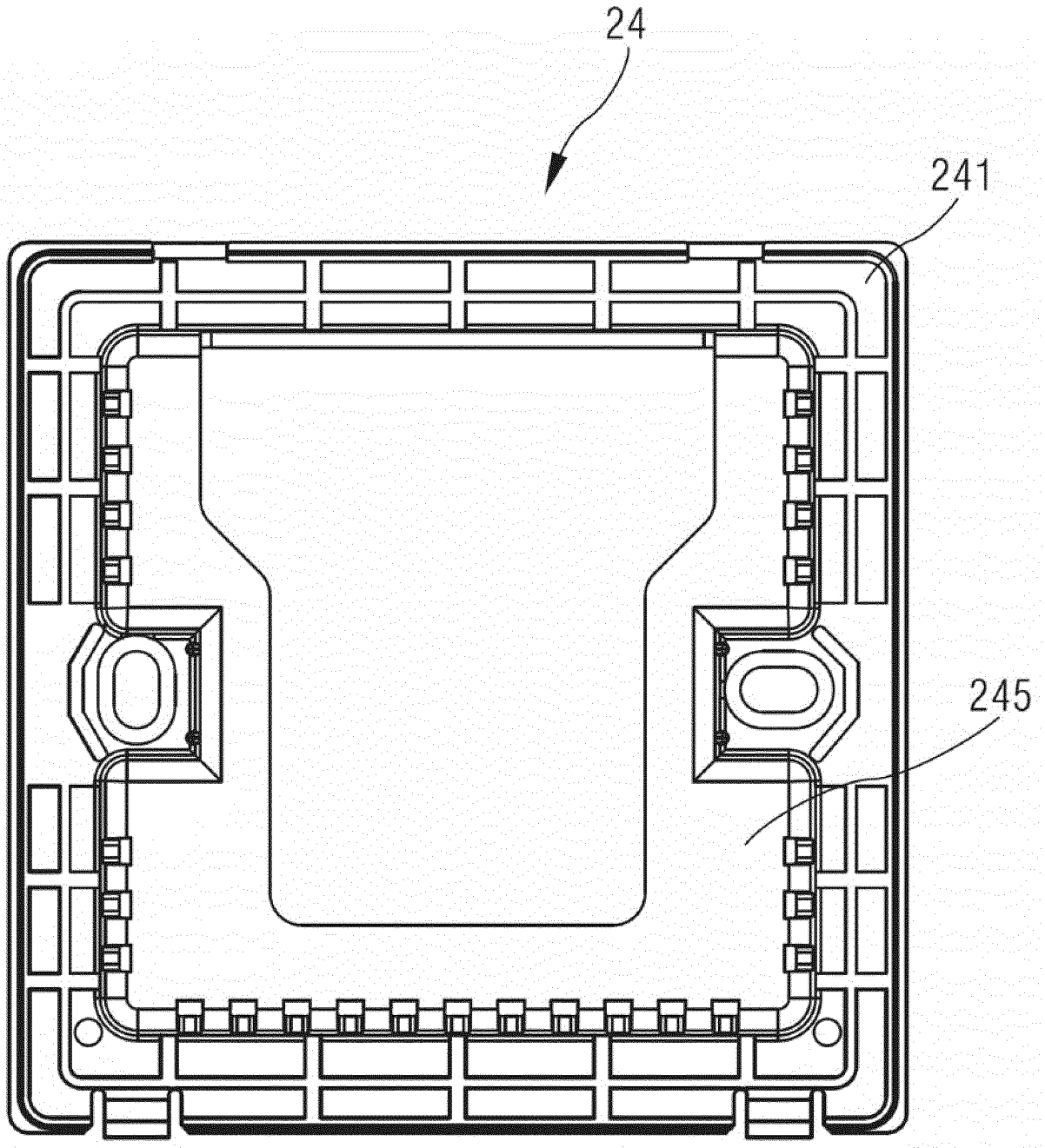


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2018/060874

A. CLASSIFICATION OF SUBJECT MATTER
INV. H05K5/00 H05K5/02
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H05K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 2010/101854 A1 (WALLAERT TIMOTHY [US] ET AL) 29 April 2010 (2010-04-29) paragraph [0031] - paragraph [0039]; figures 3-7	1-4,6-10 5
X	EP 2 327 285 A1 (SIEMENS INDUSTRY INC [US]) 1 June 2011 (2011-06-01) paragraph [0012] - paragraph [0015]; figure 1	1
Y	EP 1 113 713 A2 (CARRIER CORP [US]) 4 July 2001 (2001-07-04) paragraph [0020] - paragraph [0021]; figures 1,7	5
Y	US 5 087 794 A (NELSON CLIFFORD L [US]) 11 February 1992 (1992-02-11) column 1; figures 1-3	5

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 July 2018	25/07/2018

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2018/060874

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010101854 A1	29-04-2010	NONE	
EP 2327285 A1	01-06-2011	BR PI0917373 A2	17-11-2015
		CA 2734890 A1	25-02-2010
		CN 102197716 A	21-09-2011
		EP 2327285 A1	01-06-2011
		KR 20110057163 A	31-05-2011
		US 2011226506 A1	22-09-2011
		WO 2010022297 A1	25-02-2010
EP 1113713 A2	04-07-2001	DE 60033364 T2	21-06-2007
		EP 1113713 A2	04-07-2001
		US 6362953 B1	26-03-2002
US 5087794 A	11-02-1992	NONE	