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(72) Inventors:
• **CAO, Yanhua**
Jilin 130000 (CN)
• **ZHAO, Jinlong**
Jilin 130000 (CN)
• **CAO, Xianwei**
Jilin 130000 (CN)
• **LI, Changsheng**
Jilin 130000 (CN)

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(74) Representative: **Laufhütte, Dieter**
Lorenz Seidler Gossel
Rechtsanwälte Patentanwälte
Partnerschaft mbB
Widenmayerstraße 23
80538 München (DE)

(71) Applicant: **CRRRC Changchun Railway Vehicles Co., Ltd.**
Changchun, Jilin 130000 (CN)

(54) **RAIL TRAIN AND SIDE WALL THEREOF**

(57) A side wall of a rail train, comprising a wall body (1) and a glass window (2) mounted on the wall body (1). The wall body (1) comprises an inner wall board and an outer wall board which are connected to each other, the wall body (1) is a double layered sandwich structure, a partition space (3), for transporting an air-conditioning air stream, being provided in the middle of the wall body, an upper end of the partition space (3) being located at the upper part of the wall body (1), and air inlets (4), for communicating with an air supply passage at the top of a compartment, being provided on the upper end of the partition space, and a lower end of the partition space (3) being located at the lower part of the wall (1), and an air outlet (5), for communicating with the inside of the compartment, being provided on the lower end of the partition space. The warm air generated by a heating system enters, through the air inlets (4), into the partition space (3), and then the warm air is delivered into the compartment by means of the air outlet (5) located at the bottom of the compartment; the invention uses the heat convection principle, ensuring a uniform heating supply, making the side walls have a heating function, ensuring the temperature of the side walls in a cold environment, and improving the overall thermal comfort in the compartment. A rail train comprising the side wall above.

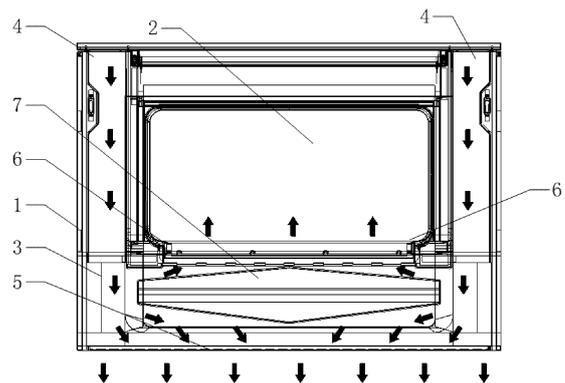


Figure 1

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Description

5 [0001] The present application claims priorities to Chinese Patent Application titled "RAIL TRAIN AND SIDEWALL THEREOF" and Chinese Utility Model Application titled "RAIL TRAIN AND SIDEWALL THEREOF" filed on December 27, 2017 with the China National Intellectual Property Administration, the disclosures of which are incorporated herein by reference.

FIELD

10 [0002] The present application relates to the technical field of trains, in particular to a sidewall of a rail train. Moreover, the present application further relates to a rail train including the sidewall.

BACKGROUND

15 [0003] If operating in a cold environment, rail trains such as high speed trains are required to be equipped with a heating system in order to improve the ride comfort.

[0004] Conventional rail trains are generally heated by providing a warm air system. An air supply passage of the warm air system is arranged on the top of a carriage, and according to the principle of thermal convection, hot air mainly gathers in an upper space, and cold air mainly gathers in a lower space. Therefore, the heating effect is not good. In addition, a side wall of the rail train as a main structure generally includes a wall body and a glass window installed to the wall body. The wall body includes an inner wall plate and an outer wall plate connected to each other, and only functions as a support structure rather than heating the inside of the carriage. Although built-in parts are arranged inside the wall body and can play a certain role in thermal insulation, the wall body with a too low temperature may absorb heat of the hot air inside the carriage, and continuously conduct the heat to the outside, thus seriously affecting the heating and thermal insulation effects inside the carriage.

25 [0005] Therefore, a technical issue to be addressed presently by those skilled in the art is to improve the heating and thermal insulation effects inside the carriage.

SUMMARY

30 [0006] An object of the present application is to provide a rail train sidewall, in which a partition chamber in communication with an air supply passage at the top of a carriage is provided, and the partition chamber is capable of conveying warm air generated by a heating system into the carriage from the bottom of the carriage to improve the heating effect. Another object of the present application is to provide a rail train including the above sidewall.

35 [0007] In order to address the above technical issues, a rail train sidewall is provided according to the present application, which includes a wall body and a glass window mounted to the wall body. The wall body includes an inner wall plate and an outer wall plate connected to each other. The wall body has a double-layered sandwich structure, and a partition chamber configured to convey air-conditioning airflow is provided in the middle of the wall body. An upper end of the partition chamber is located at an upper part of the wall body and is provided with an air inlet configured to communicate with an air supply passage at a top of a carriage, and a lower end of the partition chamber is located at a lower part of the wall body and is provided with an air outlet configured to communicate with an inside of the carriage.

[0008] Preferably, a gap is provided between an outer side face of the partition chamber and the inner wall plate and a gap is provided between another outer side face of the partition chamber and the outer wall plate.

45 [0009] Preferably, support ribs configured to respectively connect the outer side face of the partition chamber to the inner wall plate and connect the other outer side face of the partition chamber to the outer wall plate are arranged in the gaps.

[0010] Preferably, the partition chamber includes two air inlets, which are respectively located at two sides of the glass window.

50 [0011] Preferably, a control air port in communication with the air outlet is provided at a lower end of the inner wall plate, and a control member configured to control opening degree of the control air port is mounted at the control air port.

[0012] Preferably, the control air port is an elliptical port, and the control member is a fin.

[0013] Preferably, the rail train sidewall includes multiple control air ports sequentially arranged in a horizontal direction, the air outlet is a long port arranged in the horizontal direction, and the long port is in communication with the multiple control air ports simultaneously.

55 [0014] Preferably, at each of positions at two sides of a portion where the inner wall plate is connected to the lower end of the glass window, an auxiliary air port configured to blow air-conditioning airflow towards a glass is provided, and the auxiliary air ports face upwards and are in communication with the partition chamber.

[0015] Preferably, a diamond-shaped diverter is arranged in the partition chamber, two ends of the diamond-shaped

diverter in a length direction thereof are respectively located below the two auxiliary air ports; and, the diamond-shaped diverter is located below the glass window, and has upper air guiding slopes and lower air guiding slopes, the upper air guiding slopes are left-right symmetric and configured to divert the air-conditioning airflow to the auxiliary air ports, and the lower air guiding slopes are left-right symmetric and configured to divert the air-conditioning airflow to the air outlet.

[0016] A rail train is further provided according to the present application, which includes a frame and a rail train sidewall mounted to the frame. The rail train sidewall is the rail train sidewall according to any one of the above aspects.

[0017] The rail train sidewall according to the present application includes a wall body and a glass window mounted to the wall body. The wall body includes an inner wall plate and an outer wall plate connected to each other, and a partition chamber is provided between the inner wall plate and the outer wall plate. An upper end of the partition chamber is located at an upper end of the wall body and is provided with an air inlet configured to communicate with an air supply passage at a top of a carriage, and a lower end of the partition chamber is located at a lower end of the wall body and is provided with an air outlet configured to communicate with the inside of the carriage. The warm air generated by the heating system enters the partition chamber via the air inlet, then is conveyed to the inside of the carriage via the air outlet at the bottom of the carriage, which utilizes the principle of heat convection to ensure the uniformity of the heating and enable the sidewall to have a function of heating. Thus, the temperature of the sidewall is ensured in a cold environment and the overall comfort of temperature inside the carriage is improved.

[0018] The rail train including the above sidewall is further provided according to the present application. Since the sidewall has the above technical effects, the rail train should also have the same technical effects, which are not described in detail herein.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019]

Figure 1 is a schematic view showing the structure of a rail train sidewall according to an embodiment of the present application; and

Figure 2 is a sectional view showing the position of a diamond-shaped air diverter in an embodiment of the rail train sidewall according to the present application.

Reference Numerals in Figures 1 to 2:

1 wall body;	2 glass window;
3 partition chamber;	4 air inlet;
5 air outlet;	6 auxiliary air port;
7 diamond-shaped air diverter.	

DETAILED DESCRIPTION

[0020] A core of the present application is to provide a rail train sidewall, in which a partition chamber in communication with an air supply passage at the top of a carriage is provided, and the partition chamber is capable of conveying warm air generated by a heating system to the inside of the carriage from the bottom of the carriage to improve the heating effect. Another core of the present application is to provide a rail train including the above sidewall.

[0021] In order to enable those skilled in the art to better understand the solutions of the present application, the present application is further described in detail hereinafter with reference to the drawings and embodiments.

[0022] Reference is made to Figures 1 and 2. Figure 1 is a schematic view showing the structure of an embodiment of a rail train sidewall according to the present application; and Figure 2 is a sectional view showing the position of a diamond-shaped air diverter in an embodiment of the rail train sidewall according to the present application.

[0023] A rail train sidewall is provided according to an embodiment of the present application, which includes a wall body 1 and a glass window 2 mounted to the wall body 1. The wall body 1 includes an inner wall plate and an outer wall plate connected to each other. The inner wall plate faces the inside of the carriage, and the outer wall plate faces the outside of the carriage. The wall body 1 has a double-layer sandwich structure. A partition chamber 3 is provided between the inner wall plate and the outer wall plate. An upper end of the partition chamber 3 is located at an upper end of the wall body 1 and is provided with an air inlet 4, and a lower end of the partition chamber 3 is located at a lower end of the wall body 1 and is provided with an air outlet 5. The air inlet 4 is in communication with the air supply passage at the top of the carriage, and the air outlet 5 is in communication with the inside of the carriage.

[0024] It can be seen from the above description that, the air inlet 4 at the upper end of the wall body 1 is in communication

with the air outlet 5 at the lower end via the partition chamber 3.

[0025] The warm air generated by the heating system enters the partition chamber 3 via the air inlet 4, and then is conveyed to the inside of the carriage via the air outlet 5 at the bottom of the carriage, which utilizes the principle of heat convection to ensure the uniformity of the heating and enable the sidewall to have a function of heating. Thus, the temperature of the sidewall in a cold environment is ensured, and the overall comfort of temperature inside the carriage is improved.

[0026] In order to improve the thermal insulation effect, a gap is provided between an inward outer side face of the partition chamber 3 and the inner wall plate, and a gap is also provided between an outward outer side face of the partition chamber 3 and the outer wall plate. That is, the partition chamber 3 is formed between the two gaps located between the inner wall body and the outer wall body. The thermal insulation effect of the wall body 1 is improved by providing the gaps, and moreover, in order to improve the strength, support ribs can be provided in the gaps, i.e., support ribs are connected between the inward outer side face of the partition chamber 3 and the inner wall plate, and support ribs are connected between the outward outer side face of the partition chamber 3 and the outer wall plate.

[0027] In the rail train sidewall according to an embodiment of the present application, in order to adapt to the shape of the wall body 1, the partition chamber 3 may be provided with two air inlets 4, and the two air inlets 4 are respectively located at two sides of the glass window 2. Correspondingly, the partition chamber 3 includes a main air passage and two branched air passages in communication with each other. The main air passage is located below the glass window 2, and a lower end of the main air passage is just the air outlet 5. The two branched air passages are located on the two sides of the glass window 2, lower ends of the branched air passages are in communication with the main air passage, and upper ends of the branched air passages are just the air inlets 4.

[0028] In order to supply air into the carriage, a control air port may be provided at a lower end of the inner wall plate, the air outlet 5 is in communication with the control air port, and a control member is installed at the control air port. The opening degree of the control air port may be adjusted by the control member, to further adjust the delivery capacity of the warm air to realize the adjustable control of the heat supplying capacity.

[0029] Specifically, the control air port may be ellipse shaped, the control member may be a fin, and the shape of the control air port and the type of the control member may also be adjusted according to the conditions, all of which are within the scope of the present application.

[0030] Further, multiple control air ports may be provided and may be sequentially arranged at the bottom of the inner wall plate in a horizontal direction, and each control air port is equipped with a control member. The air outlet 5 is specifically a horizontally arranged long port, and the long port is in communication with multiple control air ports simultaneously, and the opening degree of the control air ports can be adjusted respectively by the control members, to meet the heating requirements of different positions in the carriage. That is, the opening and closing as well as the opening degree of the control air ports can be controlled according to different requirements of the air flow rate.

[0031] On the basis of the rail train sidewall according to the above embodiments, two auxiliary air ports 6 are further provided and are respectively located at positions at two sides of a portion where the inner wall plate is connected to the lower end of the glass window 2, and the auxiliary air ports 6 face upwards and are in communication with the partition chamber 3. The warm air can be blown from the bottom to the glass window 2, thus preventing the glass window 2 from frosting. Moreover, in order to guide the airflow, a diamond-shaped diverter 7 may be provided in the partition chamber 3, and two ends of the diamond-shaped diverter 7 in a longitudinal direction thereof are respectively located below the two auxiliary air ports 6, that is, the diamond-shaped diverter 7 is located below the glass window 2, and has a length adapted to the width of the glass window, such that after the warm air enters from the air inlets 4 at the two sides of the glass window 2, the warm air may run into the diamond-shaped diverter 7 after flowing downwards, and a small part of the warm air is diverted to the auxiliary air ports 6, and most of the warm air is diverted to the air outlet 5. The diamond-shaped diverter 7 is located below the glass window 2 and has upper air guiding slopes and lower air guiding slopes, the upper air guiding slopes are left-right symmetric and configured to divert the air-conditioning airflow to the auxiliary air ports 6, and the lower air guiding slopes are left-right symmetric and configured to divert the air-conditioning airflow to the air outlet 5.

[0032] In addition to the above rail train sidewall, a rail train including the above sidewall is further provided according to an embodiment of the present application. Reference may be made to the conventional technology for the structures of other parts of the rail train, which are not described herein again.

[0033] The rail train and the sidewall thereof according to the present application are described in detail hereinbefore. The principle and the embodiments of the present application are illustrated herein by specific examples. The above description of examples is only intended to help the understanding of the method and core concept of the present application. It should be noted that, for those skilled in the art, a few of modifications and improvements may be made to the present application without departing from the principle of the present application, and these modifications and improvements are also deemed to fall into the scope of protection of the present application defined by the claims.

Claims

1. A rail train sidewall, comprising a wall body (1) and a glass window (2) mounted to the wall body (1), the wall body (1) comprising an inner wall plate and an outer wall plate connected to each other, wherein:
5 the wall body (1) is a double-layered sandwich structure, a partition chamber (3) configured to convey air-conditioning airflow is provided in a middle of the wall body (1), an upper end of the partition chamber (3) is located at an upper part of the wall body (1) and is provided with an air inlet (4) configured to communicate with an air supply passage at a top of a carriage, and a lower end of the partition chamber (3) is located at a lower part of the wall body (1) and is provided with an air outlet (5) configured to communicate with an inside of the carriage.
10
2. The rail train sidewall according to claim 1, wherein a gap is provided between an outer side face of the partition chamber (3) and the inner wall plate, and a gap is provided between another outer side face of the partition chamber (3) and the outer wall plate.
- 15 3. The rail train sidewall according to claim 2, wherein support ribs configured to respectively connect the outer side face of the partition chamber (3) to the inner wall plate and connect another outer side face of the partition chamber (3) to the outer wall plate are arranged in the gaps.
- 20 4. The rail train sidewall according to claim 3, wherein the partition chamber (3) comprises two air inlets (4), which are respectively located at two sides of the glass window (2).
5. The rail train sidewall according to claim 4, wherein a control air port in communication with the air outlet (5) is provided at a lower end of the inner wall plate, and a control member configured to control opening degree of the control air port is mounted at the control air port.
25
6. The rail train sidewall according to claim 5, wherein the control air port is ellipse shaped, and the control member is a fin.
7. The rail train sidewall according to claim 6, comprising a plurality of control air ports sequentially arranged in a horizontal direction, wherein the air outlet (5) is a long port arranged in the horizontal direction, and the long port is in communication with the plurality of control air ports simultaneously.
30
8. The rail train sidewall according to any one of claims 1 to 7, wherein at each of positions at two sides of a portion where the inner wall plate is connected to the lower end of the glass window (2), an auxiliary air port (6) configured to blow the air-conditioning airflow towards a glass is provided, and the auxiliary air ports (6) face upwards and are in communication with the partition chamber (3).
35
9. The rail train sidewall according to claim 8, wherein a diamond-shaped diverter (7) is arranged in the partition chamber (3), two ends of the diamond-shaped diverter (7) in a longitudinal direction of the diamond-shaped diverter (7) are respectively located below the two auxiliary air ports (6), the diamond-shaped diverter (7) is located below the glass window (2) and has upper air guiding slopes and lower air guiding slopes, the upper air guiding slopes are left-right symmetric and configured to divert the air-conditioning airflow to the auxiliary air ports (6), and the lower air guiding slopes are left-right symmetric and configured to divert the air-conditioning airflow to the air outlet (5).
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10. A rail train, comprising a frame and a rail train sidewall mounted to the frame, wherein the rail train sidewall is the rail train sidewall according to any one of claims 1 to 9.
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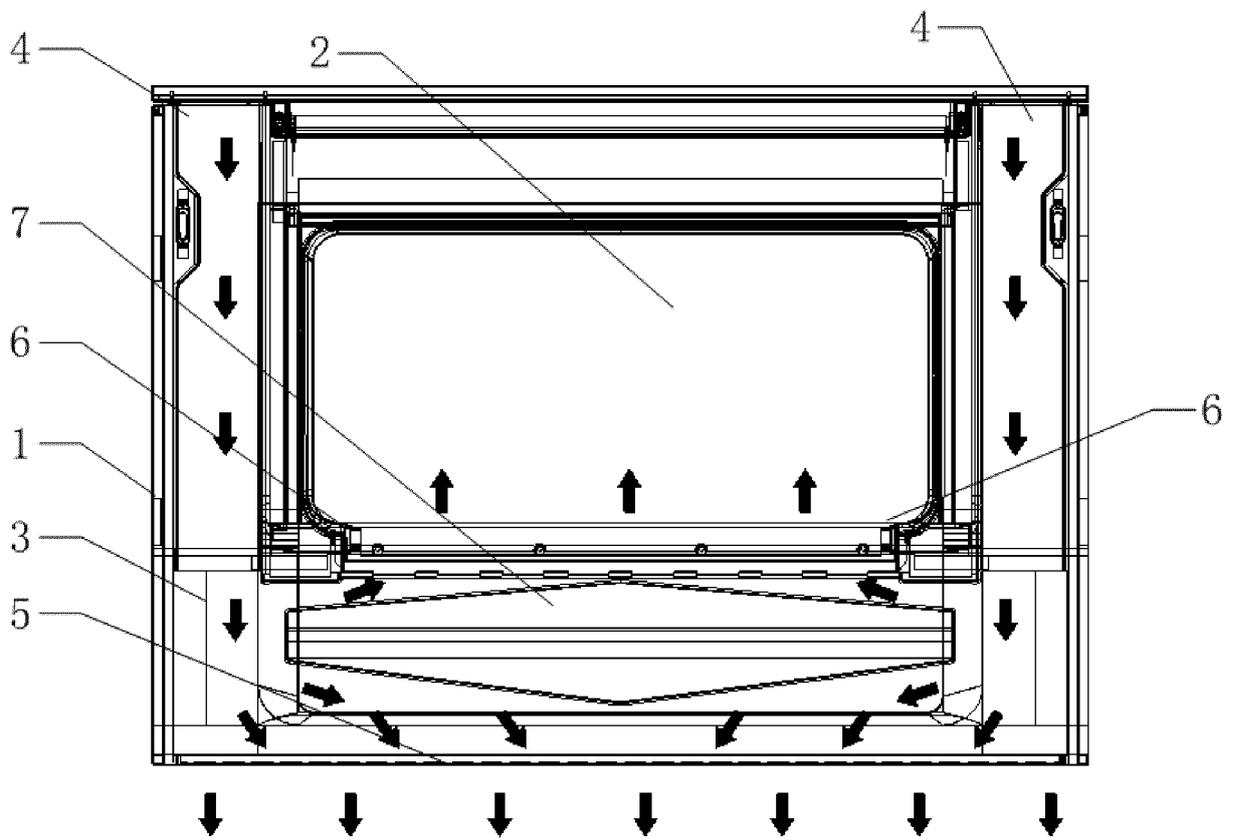


Figure 1

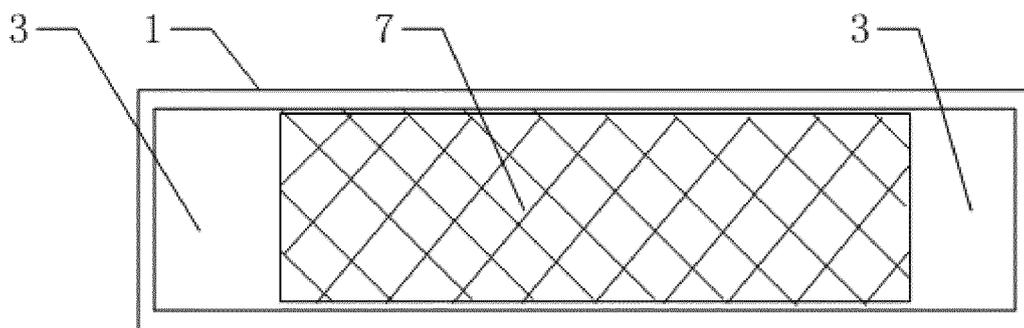


Figure 2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2017/119337

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A. CLASSIFICATION OF SUBJECT MATTER		
B61D 17/04(2006.01)i; B61D 27/00(2006.01)i		
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)		
B61D		
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)		
CNABS, CNTXT, VEN, SIPOABS, 轨道交通, 侧墙, 玻璃窗, 内墙, 外墙, 空腔, 隔腔, 气流, train, wall, inner, inside, outside, cavum, air current, airflow		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 105438198 A (TANGSHAN RAILWAY VEHICLE CO., LTD.) 30 March 2016 (2016-03-30) description, paragraphs [0026]-[0032], and figures 1 and 4	1, 10
Y	CN 102897177 A (TANGSHAN RAILWAY VEHICLE CO., LTD.) 30 January 2013 (2013-01-30) description, paragraphs [0015]-[0016]	1, 10
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A	CN 201198315 Y (TRANSPORT BUREAU, THE MINISTRY OF RAILWAYS THE PEOPLE'S REPUBLIC OF CHINA ET AL.) 25 February 2009 (2009-02-25) entire document	1-10
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A	US 6416116 B1 (NEW FLYER IND. LTD.) 09 July 2002 (2002-07-09) entire document	1-10
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family	
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2017/119337

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CN 102897177 A	30 January 2013	CN 102897177 B	17 February 2016
CN 205440361 U	10 August 2016	None	
CN 201198315 Y	25 February 2009	None	
CN 201941789 U	24 August 2011	None	
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