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[Continued on next page]

(54) Title: COLD BOX INSTALLATION

(57) Abstract: A cold box installation (1) has a platform (10) movably connec-
ted to the cold box that allows for vertical movement about the cold box. The
installation provides for improved safety and performance for operation person-
nel when the operation personnel need to have access to various locations along
the height of the cold box.

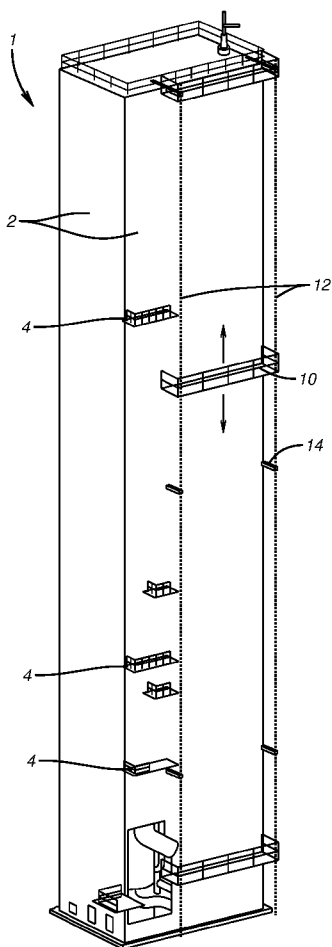


FIG. 2



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— *with international search report (Art. 21(3))*

COLD BOX INSTALLATION

Technical Field of the Invention

[0001] The present invention relates to an improved safety device for gaining access to various heights on a cold box.

Background of the Invention

[0002] An air separation unit (ASU) produces oxygen, nitrogen and argon in both gaseous and liquid forms. As cryogenic distillation is the method used to separate the gases, a cold box surrounding the ASU and related cryogenic equipment is used to provide insulation from the outside in order to prevent excessive heat loss from the ASU, as well as ice build-up on the equipment. It is very common for instrumentation to be located at different levels on the cold box, which has heretofore been accessible by permanent carbon steel platforms through ladders or stairs.

[0003] FIG. 1 represents an embodiment as known in the prior art. Cold box installation 1 includes a plurality of walls 2, a plurality of stationary platforms 4, and a set of stairs 6 and walkways 8, which allow for operations personnel to move about the height H of the cold box installation 1. In a typical cold box installation, these stairs and walkways can weigh over 46 tons and take at least two weeks to erect using up to 20 people and a crane. Consequently, these permanent platforms require a lot of extra steel, require additional time to install, and prevent easy access to various levels since the workers have to scale many floors to get to the top.

[0004] Therefore, there is clearly a need for a method and apparatus which allows for workers to safely and efficiently access the various heights of a cold box.

Summary of the Invention

[0005] The present invention is directed to a device and a method that satisfies at least one of these needs. Certain embodiments of the present invention relate to a cold box that uses a movable platform in order to gain access to various points along the height of the cold box. In certain embodiments, the movable platform can replace permanent stair and platforms, or it can be supplemental.

[0006] In one embodiment, the cold box installation can include a cold box having a plurality of walls, a top, and a bottom; a plurality of instrumentation disposed on at least one of the walls at varying heights along said walls; and a platform movably connected to the cold box, the platform configured to move vertically along the height of the wall and provide access to the plurality of instrumentation. In one embodiment, the platform is configured to move between the bottom of the cold box to the top of the cold box. In another embodiment, the platform is configured to be accessible by a human.

[0007] In another embodiment, the cold box is in direct contact with the atmosphere. In another embodiment, the platform is movably connected using strand cables and a motor. In another embodiment, the platform is movably connected using strand cables and a hand crank.

[0008] In another embodiment, the cold box installation can also include guide supports that are configured to minimize horizontal movement of the platform. In one embodiment, the cold box further includes a plurality of stationary platforms disposed on one of the walls, wherein the stationary platforms are spaced about the height of the cold box. In another embodiment, the platform movably connected to the cold box is configured to provide access to the stationary

platforms such that a human can move from the platform movably connected to the cold box to the stationary platform without encountering a walking obstruction.

[0009] In another embodiment, the cold box does not contain windows. In one embodiment, the platform further includes safety rails around at least a portion of its periphery. In another embodiment, the platform further comprises a cut out adapted to allow the platform to move past fixed objects disposed on the wall of the cold box.

[0010] In another embodiment, the platform comprises a first portion and a second portion, wherein the first portion is proximal the wall and is configured to be movable about the platform such that the platform can move past fixed objects disposed on the wall of the cold box. In another embodiment, the first portion is configured to slide towards the second portion. In another embodiment, the first portion is configured to rotate towards the second portion.

Brief Description of the Drawings

[0011] These and other features, aspects, and advantages of the present invention will become better understood with regard to the following description, claims, and accompanying drawings. It is to be noted, however, that the drawings illustrate only several embodiments of the invention and are therefore not to be considered limiting of the invention's scope as it can admit to other equally effective embodiments.

[0012] FIG. 1 shows a cold box installation in accordance with the prior art.

[0013] FIG. 2 shows a cold box installation in accordance with an embodiment of the invention.

[0014] FIG. 3 shows a cold box installation in accordance with an embodiment of the invention.

[0015] FIG. 4 shows a platform in accordance with an embodiment of the invention.

[0016] FIG. 5 shows a platform in accordance with an embodiment of the invention.

[0017] FIG. 6 shows a sliding platform in accordance with an embodiment of the invention.

Detailed Description

[0018] While the invention will be described in connection with several embodiments, it will be understood that it is not intended to limit the invention to those embodiments. On the contrary, it is intended to cover all the alternatives, modifications and equivalence as may be included within the spirit and scope of the invention defined by the appended claims.

[0019] Embodiments of the present invention allow for a drastic reduction of the structural steel required for stairs and walkways that are typically installed on the cold box. As noted previously, cold boxes can easily reach more than 75 meters height. As such, embodiments of the present invention provide increased safety for the workers, faster construction times, and overall reduction in costs. Additionally, because certain embodiments eliminate a majority of the steel associated with the permanent steel stairs and platforms, the opposite side of the cold box requires much less support structure, as there is less of a need for a cantilever to balance.

[0020] Now turning to FIG. 2, cold box installation 1 includes plurality of walls 2 and optionally stationary (i.e., permanent) platforms 4. However, movable platform 10 is used to traverse the height of the cold box instead of using stairs. In this embodiment, movable platform 10 is guided with cables 12. A simple pulley system can be used to move movable platform up and down. Guide support stabilizers 14 can also be used to provide additional support.

[0021] In FIG. 3, cables 12 again are provided to help move movable platform 10 about the height of the cold box. In the embodiment shown, instrumentation 16 and piping 18 protrude from the surface of wall 2. In order for movable platform to be able to move about the surface of wall 2 without hitting instrumentation 16 or piping 18, a cut-out 20 was made in movable platform 10. In embodiments in which movable platform does not go all the way to the ground, access hole 24 and ladder 21 can be provided for allowing an operator to gain access to movable platform 10.

[0022] FIG. 4 provides an isometric view of another embodiment of movable platform 10. This embodiment also contains cutout 20, as well as safety railing 22, 28 and access hole 24.

[0023] FIG. 5 provides an isometric view of another embodiment of movable platform 10. In this embodiment, cutout 20 is replaced with slidable section 30. While the embodiment shown in FIG. 5 shows the entire width sliding, those of ordinary skill in the art will recognize that any portion of the width could be made to slide, so long as the instrumentation and piping are avoided while moving along the height of the cold box. Additionally, this embodiment provides for removable protection 28. In one embodiment, removable protection 28 is configured such that it can be pushed downward such that it no longer protrudes upward from the floor of movable platform 10.

[0024] FIGS. 6a and 6b show an alternate embodiment of the sliding platform. In this embodiment, movable platform 10 is comprised of first section 34 and second section 36. In one mode of operation, first section 34 is configured to slide up and over second section 36. In a second mode of operation, first section 34 is slid back out in order to provide more depth for movable platform. Additionally, this embodiment also demonstrates hand crank 32. While an

electric motor is the preferred method for providing the power necessary to move movable platform up and down about the height of the cold box, hand crank 32 is provided as a back-up means in the event cold box installation 1 suffers an electricity outage.

Comparative Data

[0025] Table I below shows the advantages of certain embodiments of the present invention. As can be clearly seen, installation time and materials are both heavily reduced, which results in an installation that can be done faster and cheaper. The miscellaneous factor takes into account piping arrangements, which can be simplified in embodiments of the present invention since the cold box designer does not have to route piping to be accessible at the permanent walkways.

Table I: Comparative Data for a 75 m Cold Box

cold box 75m		
	normal practice	Embodiment of the Invention
3d models	3 weeks	2 days
framework calculation input of loads	3 days	2 hours
detail drawings	12 weeks	2 weeks
Access platform weight	45 tons	5 tons
manufacturing	50 days	5 days
Volume	675 m ³	18 m ³
installation on site time	15 days	2 days
manpower	20 persons	2 persons
big crane for installation	yes	no
miscellaneous (piping arrangements)	80 tons	70 tons

[0026] While the invention has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications, and variations will be apparent to those skilled in the art in light of the foregoing description. Accordingly, it is intended to embrace all such

alternatives, modifications, and variations as fall within the spirit and broad scope of the appended claims. The present invention may suitably comprise, consist or consist essentially of the elements disclosed and may be practiced in the absence of an element not disclosed. Furthermore, if there is language referring to order, such as first and second, it should be understood in an exemplary sense and not in a limiting sense. For example, it can be recognized by those skilled in the art that certain steps can be combined into a single step.

[0027] The singular forms "a", "an" and "the" include plural referents, unless the context clearly dictates otherwise.

[0028] "Comprising" in a claim is an open transitional term which means the subsequently identified claim elements are a nonexclusive listing (i.e., anything else may be additionally included and remain within the scope of "comprising"). "Comprising" as used herein may be replaced by the more limited transitional terms "consisting essentially of" and "consisting of" unless otherwise indicated herein.

[0029] "Providing" in a claim is defined to mean furnishing, supplying, making available, or preparing something. The step may be performed by any actor in the absence of express language in the claim to the contrary a range is expressed, it is to be understood that another embodiment is from the one.

[0030] Optional or optionally means that the subsequently described event or circumstances may or may not occur. The description includes instances where the event or circumstance occurs and instances where it does not occur.

[0031] Ranges may be expressed herein as from about one particular value, and/or to about another particular value. When such particular value and/or to the other particular value, along with all combinations within said range.

[0032] All references identified herein are each hereby incorporated by reference into this application in their entireties, as well as for the specific information for which each is cited.

CLAIMS

1. A cold box installation comprising:

a cold box having a plurality of walls, a top, and a bottom;

a cryogenic distillation column disposed within the plurality of walls of the cold box;

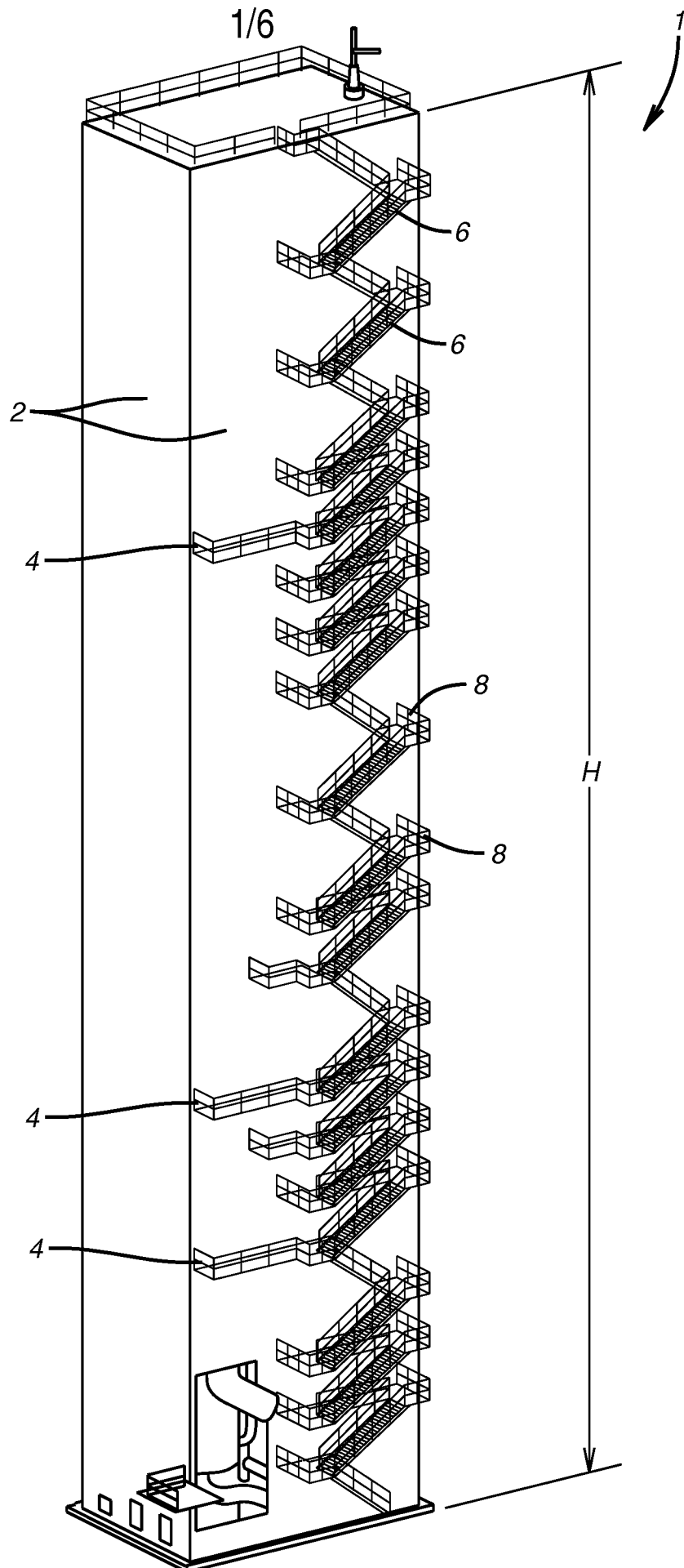
a plurality of instrumentation disposed on at least one of the walls at varying heights along said walls; and

a platform movably connected to the cold box, the platform configured to move vertically along the height of the wall and provide access to the plurality of instrumentation.
2. The cold box installation as claimed in Claim 1, wherein the platform is configured to move between the bottom of the cold box to the top of the cold box.
3. The cold box installation as claimed in Claim 1, wherein the platform is configured to be accessible by a human.
4. The cold box installation as claimed in Claim 1, wherein in the cold box is in direct contact with the atmosphere.
5. The cold box installation as claimed in Claim 1, wherein the platform is movably connected using strand cables and a motor.
6. The cold box installation as claimed in Claim 1, wherein the platform is movably connected using strand cables and a hand crank.

7. The cold box installation as claimed in Claim 1, further comprising guide supports that are configured to minimize horizontal movement of the platform.
8. The cold box installation as claimed in Claim 1, wherein the cold box further comprises a plurality of stationary platforms disposed on one of the walls, wherein the stationary platforms are spaced about the height of the cold box.
9. The cold box installation as claimed in Claim 8, wherein the platform movably connected to the cold box is configured to provide access to the stationary platforms such that a human can move from the platform movably connected to the cold box to the stationary platform without encountering a walking obstruction.
10. The cold box installation as claimed in Claim 1, wherein the cold box comprises an absence of windows.
11. The cold box installation as claimed in Claim 1, wherein the platform further comprises safety rails around at least a portion of its periphery.
12. The cold box installation as claimed in Claim 1, wherein the platform further comprises a cut out adapted to allow the platform to move past fixed objects disposed on the wall of the cold box.
13. The cold box installation as claimed in Claim 1, wherein the platform comprises a first portion and a second portion, wherein the first portion is proximal the wall and is configured to be movable about the platform such that the platform can move past fixed objects disposed on the wall of the cold box.

14. The cold box installation as claimed in Claim 13, wherein the first portion is configured to slide towards the second portion.

15. The cold box installation as claimed in Claim 13, wherein the first portion is configured to rotate towards the second portion.



(PRIOR ART)
FIG. 1

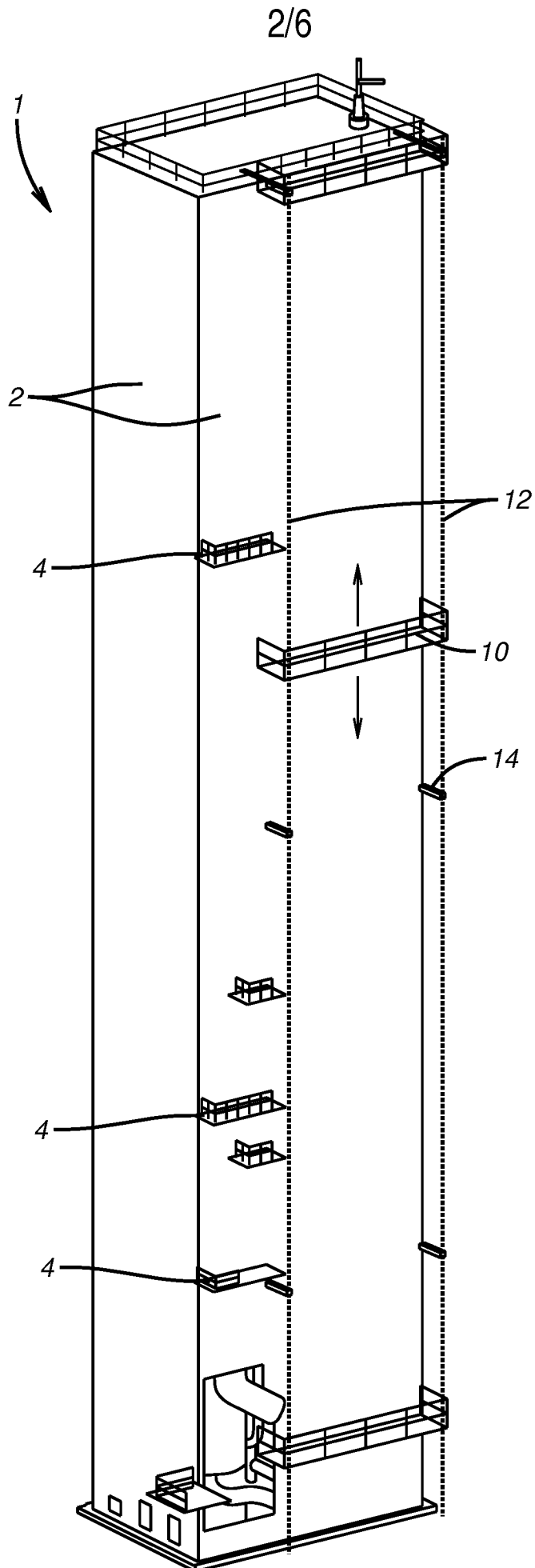
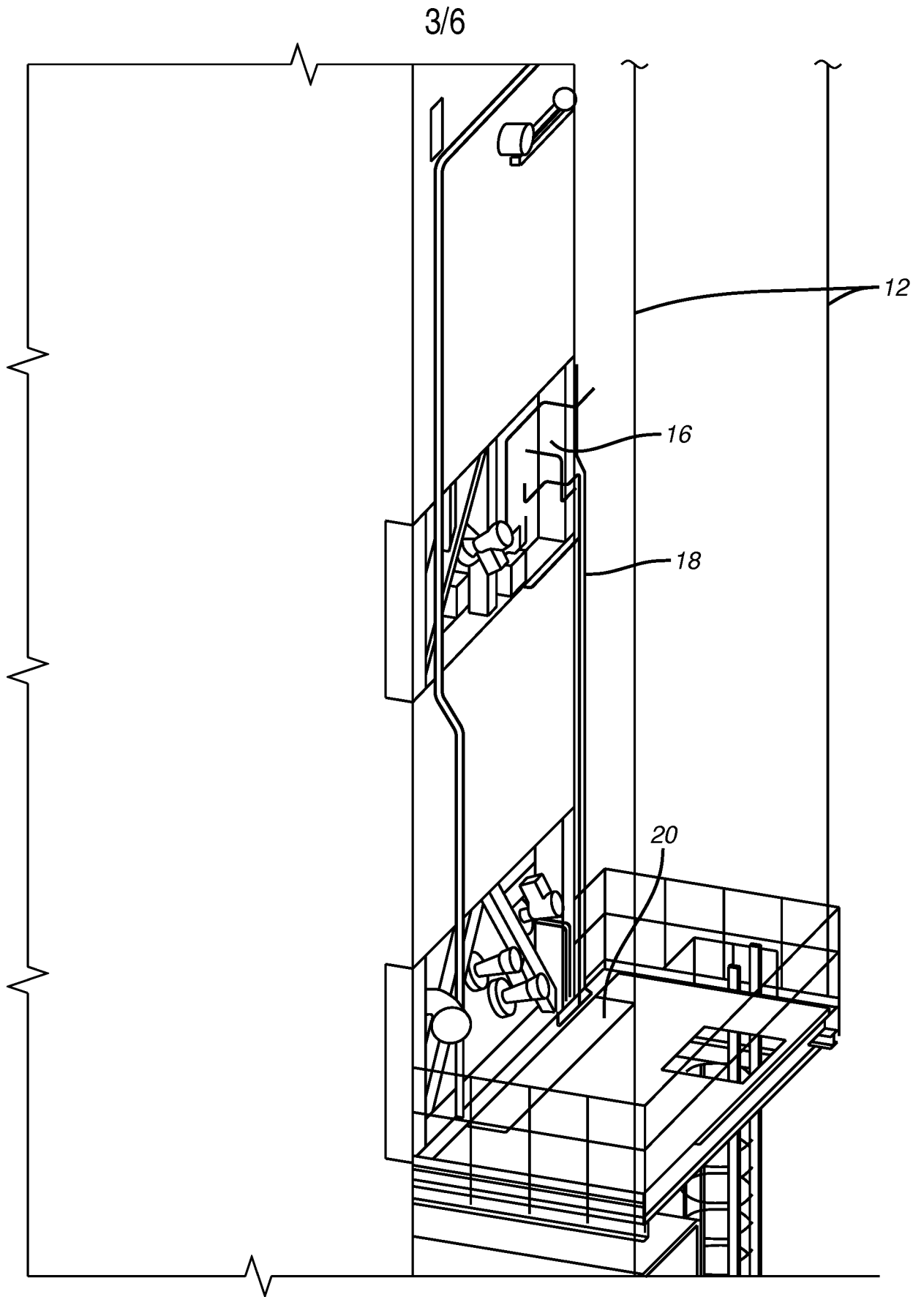


FIG. 2



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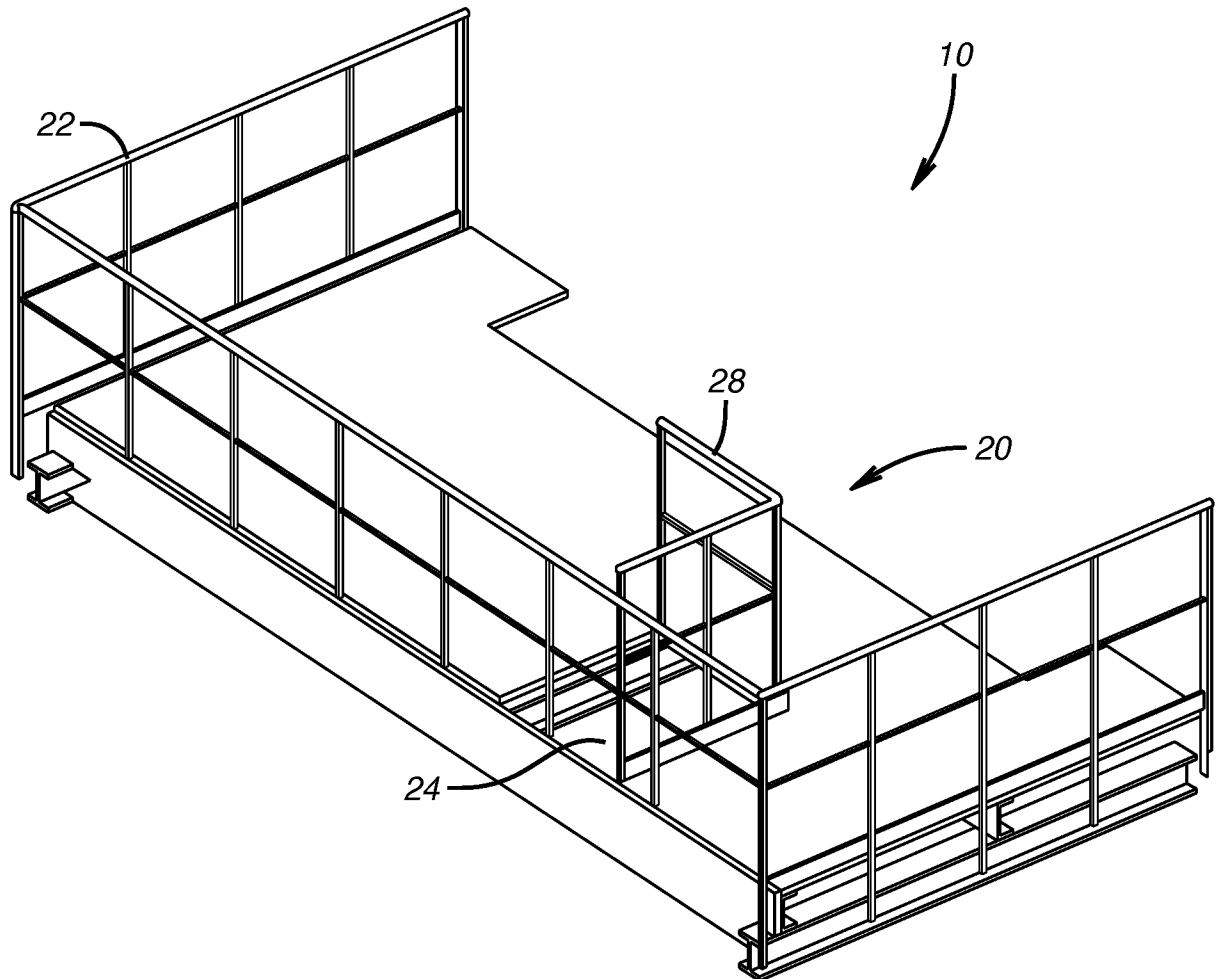
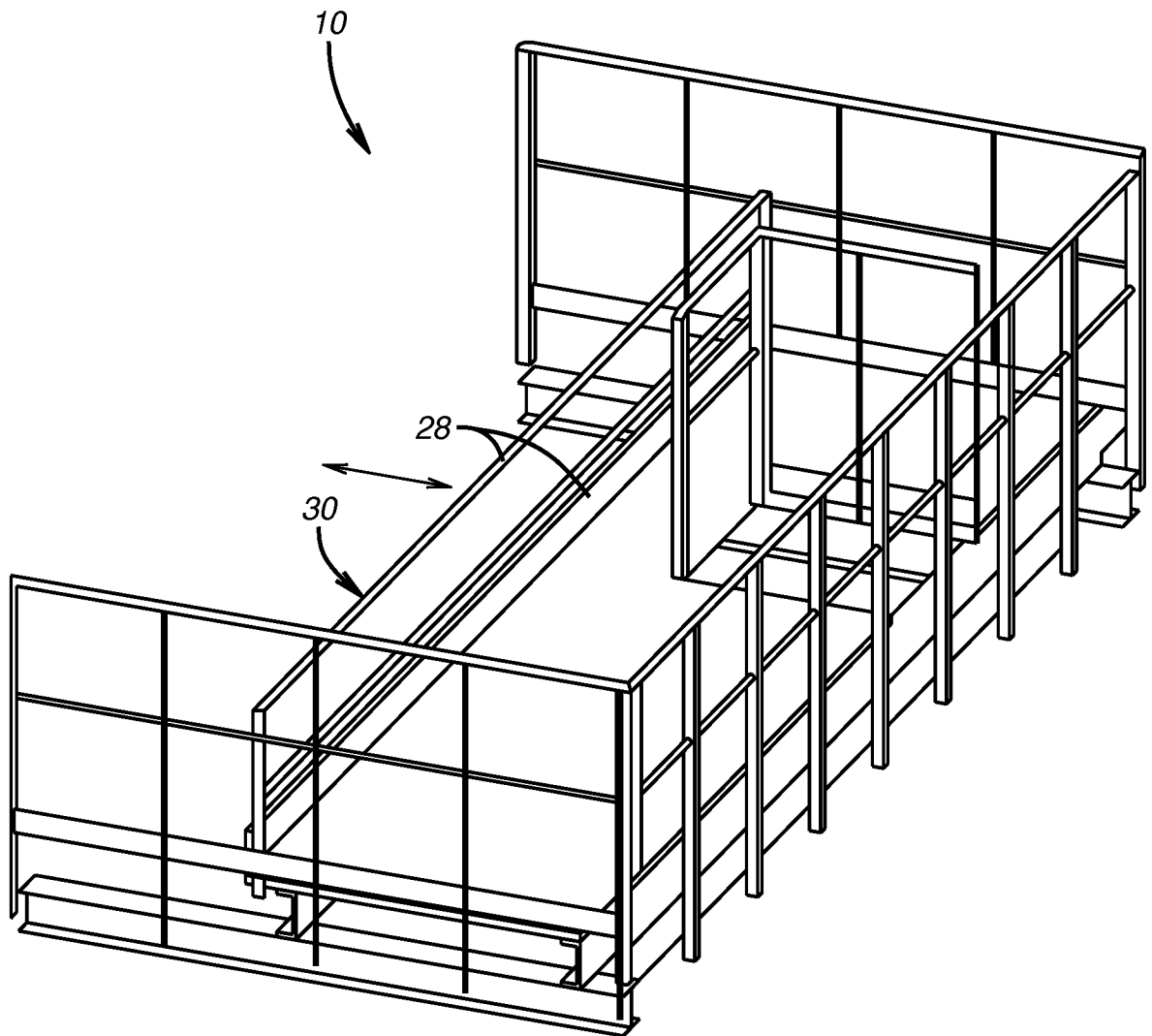


FIG. 4

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**FIG. 5**

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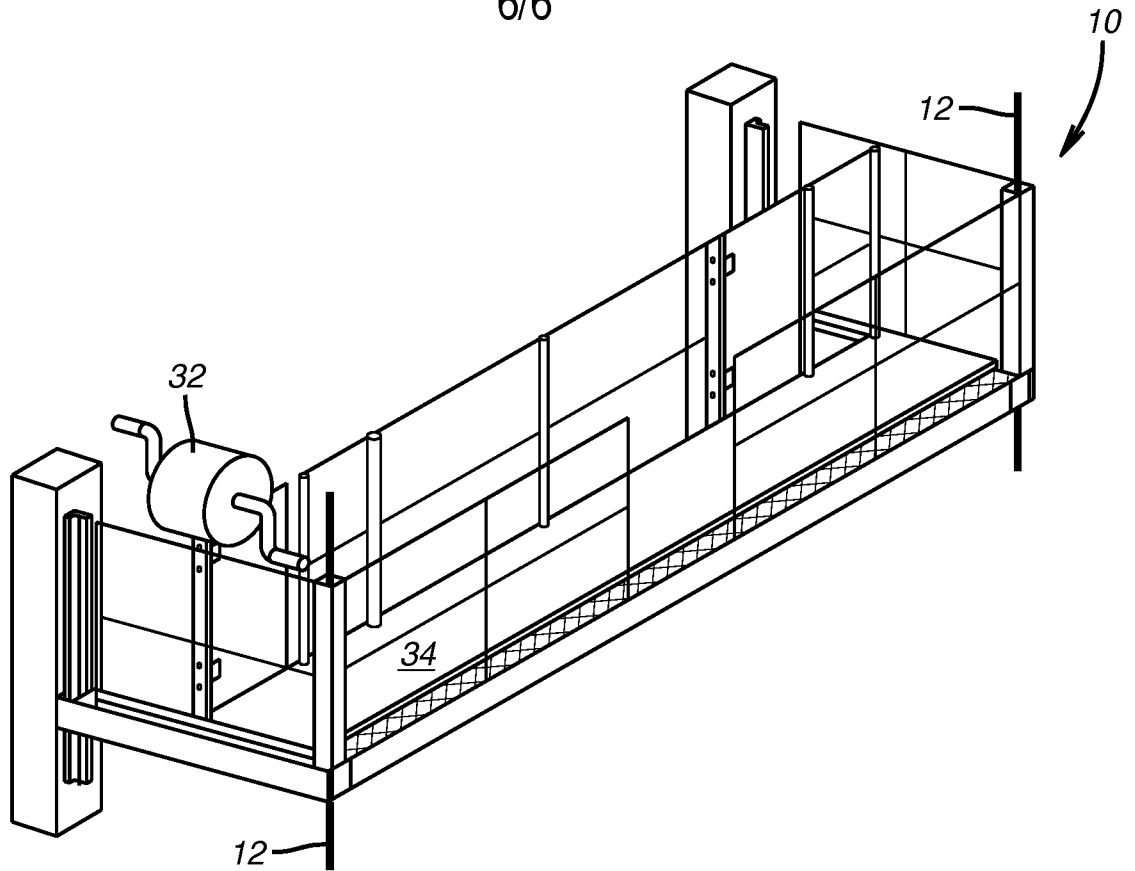


FIG. 6A

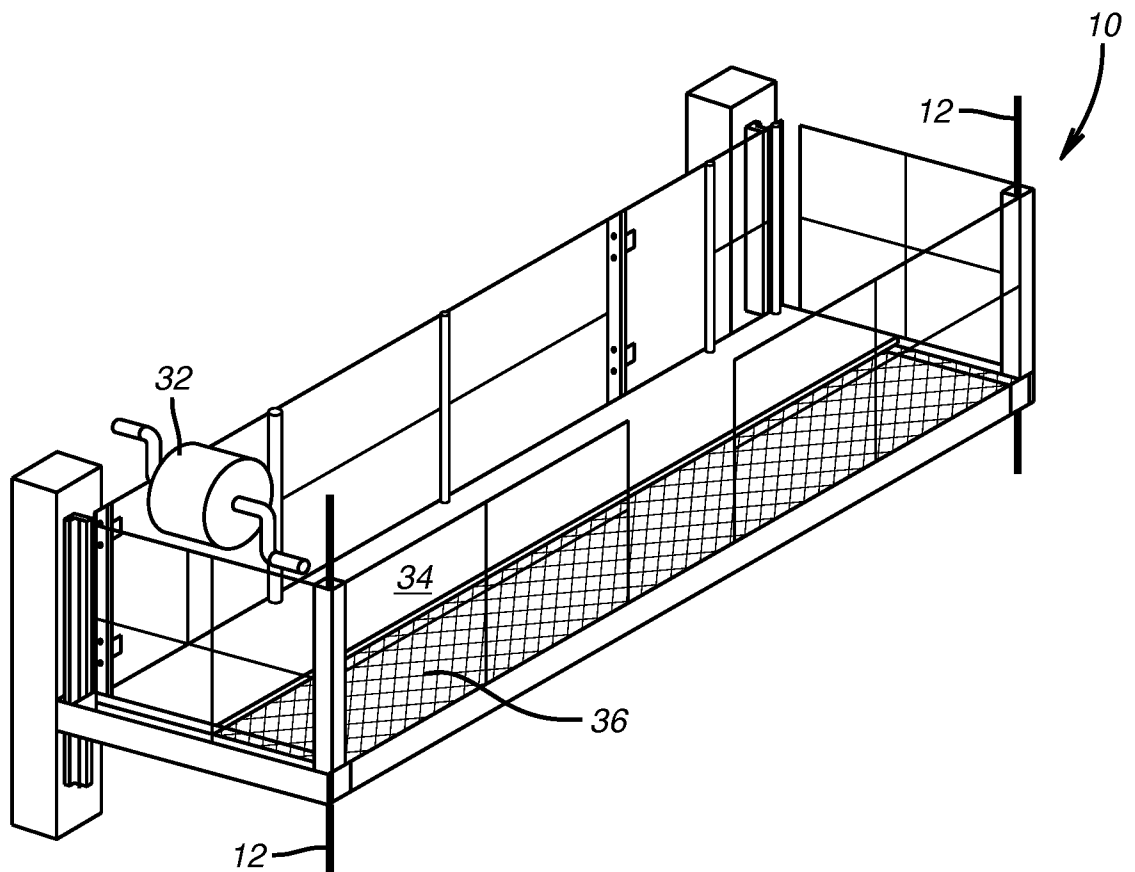


FIG. 6B

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2012/087127

A. CLASSIFICATION OF SUBJECT MATTER

See the extra sheet

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)

IPC: F25J 3, B66F 11, B66B 21

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)

CPRS, CNKI, WPI, EPODOC: lift, lifter, basket, elevator, platform, cryogenic, distill+, column, wall, tank, cold, box

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 100383484 C (AIR LIQUIDE SA) 23 April 2008(23.04.2008) Description, paragraphs 7-34 and figures 1-2	1-15
Y	CN 87206173 U (SUN, Shoulian) 17 August 1988(17.08.1988) description, page 1, line 9 to page 2, line 16 and figures 1-8	1-15
A	CN 201896016 U (SINOCHEM GROUP et al.) 13 July 2011(13.07.2011) the whole document	1-15

☒ Further documents are listed in the continuation of Box C.☒ 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
“A” document defining the general state of the art which is not considered to be of particular relevance	“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
“E” earlier application or patent but published on or after the international filing date	“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
“L” document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)	“&” document member of the same patent family
“O” document referring to an oral disclosure, use, exhibition or other means	
“P” document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 02 July 2013(02.07.2013)	Date of mailing of the international search report 19 Sep. 2013 (19.09.2013)
Name and mailing address of the ISA/CN The State Intellectual Property Office, the P.R.China 6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China 100088 Facsimile No. 86-10-62019451	Authorized officer LI, Kai Telephone No. (86-10)62085515

INTERNATIONAL SEARCH REPORT

International application No.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 20118989 U1 (SLF OBERFLAECHENTECHNIK GMBH) 14 February 2002(14.02.2002) the whole document	1-15

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2012/087127

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CN 201896016 U	13.07.2011	None	
DE 20118989 U1	14.02.2002	None	

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2012/087127

CLASSIFICATION OF SUBJECT MATTER

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