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- **YU, Kaifu**  
Qinhuangdao, Hebei 066206 (CN)
- **TANG, Tiebing**  
Qinhuangdao, Hebei 066206 (CN)
- **KANG, Long**  
Qinhuangdao, Hebei 066206 (CN)
- **CUI, Kunliang**  
Qinhuangdao, Hebei 066206 (CN)
- **WEI, Jincai**  
Qinhuangdao, Hebei 066206 (CN)
- **FENG, Wei**  
Qinhuangdao, Hebei 066206 (CN)

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(71) Applicant: **China Railway Shanhaiguan Bridge Group Co., Ltd.**  
Qinhuangdao, Hebei 066206 (CN)

(74) Representative: **Sánchez Margareto, Carolina**  
C/ Almirante Cadaros 26, bajo  
46005 Valencia (ES)

(72) Inventors:  
• **LI, Hongxia**  
Qinhuangdao, Hebei 066206 (CN)

(54) **1676 MM AND 1000 MM DUAL-GAUGE MIXED GAUGE TURNOUT**

(57) The present disclosure provides a mixed gage turnout with two gauges 1676 mm and 1000 mm, which is mainly composed of a switch machine and a stiff frog. The switch machine includes three fixed stock rails and three linked switch rails; the three stock rails are respectively a 1676mm straight-strand stock rail, a 1000mm straight-strand stock rail and a common curved-strand stock rail; the three switch rails are respectively a 1676mm curved switch rail, a 1000mm curved switch rail and a common straight switch rail; and the stiff frog is mainly composed of a bidirectional obtuse frog, a first acute frog and a second acute frog. The present disclosure provides a set scheme for a 1676mm wide gauge and a 1000mm meter gauge; furthermore, in the case of a limited space where guard rails cannot be disposed, the bidirectional obtuse frog having a self-protection function is designed.

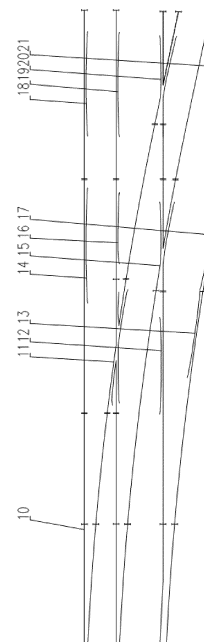


FIG. 1

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## Description

### TECHNICAL FIELD

**[0001]** The present disclosure relates to the technical field of mixed gage turnouts with two gauges, in particular to a mixed gage turnout with two gauges 1676 mm and 1000 mm.

### BACKGROUND

**[0002]** In order to meet train passing turnouts with two different gauges, two groups of the similar-flexure single turnouts with different gauges can be sleeved together to form a mixed gage turnout. In mixed gage turnouts, a three-track mixed gage turnout is the most commonly used form. One track is a common track, and the other track is set according to parameters of a vehicle wheel set.

**[0003]** A commonly used mixed gage turnout has track gauges: a 1435mm standard gauge and a 762mm inch-gauge set, a 1435 mm standard gauge and a 1000mm meter-gauge set. The invention patent CN 104452487 B publicly disclosed by the State Intellectual Property Office on February 10, 2016 discloses a three-gauge mixed gage turnout that satisfies a 1435mm standard gauge, a 1067mm meter gauge and a 1000mm meter gauge simultaneously.

**[0004]** Up to now, there is no proposal concerning a 1676mm wide gauge set and a 1000mm meter gauge set in China.

### SUMMARY

**[0005]** For the above problems, the present disclosure provides a mixed gage turnout with two gauges 1676 mm and 1000 mm.

**[0006]** The mixed gage turnout with two gauges 1676 mm and 1000 mm is mainly composed of a switch machine and a stiff frog. The switch machine includes three fixed stock rails and three linked switch rails; the three stock rails are respectively a 1676mm straight-strand stock rail, a 1000mm straight-strand stock rail and a common curved-strand stock rail; the three switch rails are respectively a 1676mm curved switch rail, a 1000mm curved switch rail and a common straight switch rail; the stiff frog is mainly composed of a bidirectional obtuse frog arranged at an intersection of the 1000mm straight-strand stock rail and 1676mm curved switch rail, a first end frog arranged at an intersection of the 1000mm curved switch rail and the common straight switch rail, and a second end frog arranged at an intersection of the 1676mm curved switch rail and the common straight switch rail. When the 1676mm curved switch rail is pulled to the 1676mm straight-strand stock rail, trains normally run on a wide-gauge 1676mm side strand and a meter-gauge 1000mm side strand; and when the common straight switch rail is pulled to the common curved-strand

stock rail, trains run on a wide-gauge 1676mm straight strand and the meter-gauge 1000mm straight strand.

**[0007]** Further, the bidirectional obtuse frog arranged includes a first long point rail connected to the 1000mm straight-strand stock rail, a first short point rail connected to the root of the first long point rail and parallel to the 1676mm curved switch rail, a second long point rail connected to a side wing rail of the first end frog facing the 1000mm straight-strand stock rail, a second short point rail connected to the root of the second long point rail and parallel to the 1000mm straight-strand stock rail, a first wing rail with two ends respectively connected to the 1676mm curved switch rail and the 1000mm straight-strand stock rail, and second wing rails arranged on sides opposite to the first wing rails.

**[0008]** Further, a first guard rail for ensuring that a 1676mm gauge train backwardly passes through the first acute turnout during opening of a straight strand, and a second guard rail for ensuring that the 1676mm gauge train backwardly passes through the second acute turnout during opening of the straight strand are arranged beside the 1676mm straight-strand stock rail; a third guard rail for ensuring that a 1000mm gauge train backwardly passes through the first acute turnout during the opening of the straight strand, and a fourth guard rail for ensuring that the 1000mm gauge train backwardly passes through the second acute turnout during opening of the straight strand are arranged beside the 1000mm straight-strand stock rail; a fifth guard rail for ensuring that the 1000mm gauge train forwardly passes through the bidirectional obtuse turnout during the opening of the straight strand is arranged beside the common straight switch rail; a sixth guard rail for ensuring that the 1676mm gauge train backwardly passes through the bidirectional obtuse turnout during opening of a side strand and a seventh guard rail for ensuring that the 1676mm gauge train backwardly passes through the second acute turnout, and an eighth guard rail for ensuring that the 1000mm gauge train backwardly passes through the bidirectional obtuse turnout during the opening of the side strand are arranged beside the common curved-strand stock rail.

**[0009]** The present disclosure provides a set scheme for a 1676mm wide gauge and a 1000mm meter gauge; furthermore, in the case of a limited space where guard rails cannot be disposed, the bidirectional obtuse frog having a self-protection function is designed; and in addition, an overall length, a front length and a back length of a line type of the mixed gage turnout can be completely consistent with those of an existing line, and transformation and upgrading of an old line and construction of a newly built line are met at the same time.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0010]** FIG. 1 is a schematic structural diagram of a mixed gage turnout with two gauges 1676 mm and 1000 mm.

## DESCRIPTION OF THE EMBODIMENTS

**[0011]** The technical solutions in the embodiments of the present disclosure will be clearly and completely described below in conjunction with the accompanying drawings. Apparently, the described embodiments are only a part of the embodiments of the present disclosure, rather than all the embodiments. Based on the embodiments in the present disclosure, all other embodiments of those of ordinary skill in the art shall fall within the scope of protection of the present disclosure.

### Embodiment 1

**[0012]** A mixed gage turnout with two gauges 1676 mm and 1000 mm, as shown in FIG. 1, is mainly composed of a switch machine and a stiff frog. The switch machine includes three fixed stock rails and three linked switch rails.

**[0013]** The three stock rails are respectively a 1676mm straight-strand stock rail 1, a 1000mm straight-strand stock rail 2 and a common curved-strand stock rail 3; and the three switch rails are respectively a 1676mm curved switch rail 5, a 1000mm curved switch rail 6 and a common straight switch rail 7. In the present embodiment, a linkage mode of the three switch rails is that each switch rail is fixedly connected with a plurality of pull rods; the plurality of pull rods are arranged at intervals in parallel and are perpendicular to the 1676mm straight-strand stock rail and the 1000mm straight-strand stock rail. The two pull rods are connected with a power device for providing power for pulling the switch rails.

**[0014]** The stiff frog is mainly composed of a bidirectional obtuse frog 11 arranged at an intersection of the 1000mm straight-strand stock rail 2 and 1676mm curved switch rail 5, a first end frog 15 arranged at an intersection of the 1000mm curved switch rail 6 and the common straight switch rail 7, and a second end frog 20 arranged at an intersection of the 1676mm curved switch rail 5 and the common straight switch rail 7. The stiff frog is an inblock cast high manganese steel frog.

**[0015]** When the 1676mm curved switch rail 5 is pulled to the 1676mm straight-strand stock rail 1, trains normally run on a wide-gauge 1676mm side strand and a meter-gauge 1000mm side strand; and when the common straight switch rail is pulled to the common curved-strand stock rail, trains run on a wide-gauge 1676mm straight strand and the meter-gauge 1000mm straight strand.

**[0016]** In order to meet the design requirements of the mixed gage turnout with two gauges 1676 mm and 1000 mm, the positions for disposing the obtuse frog and the end frog change a lot, causing that a space between the obtuse frog and the end frog is limited, and guard rails cannot be used to provide a train passing insurance when a straight strand is opened, and a 1000mm gauge train backwardly passes through the obtuse frog. In order to solve this problem, the obtuse frog is of a bidirectional frog structure that is composed of a first branch frog and

a second branch frog, with heads being opposite to each other. When the straight strand is opened and the 1000mm gauge train backwardly passes through the obtuse frog, the second branch frog can play a role of self-protection, and has an actual effect and working principle comparable to a guard rail. Specifically, in the present embodiment, the bidirectional obtuse turnout includes a first long point rail connected to the 1000mm straight-strand stock rail, a first short point rail connected to the root of the first long point rail and parallel to the 1676mm curved switch rail, a second long point rail connected to a side wing rail of the first end frog facing the 1000mm straight-strand stock rail, a second short point rail connected to the root of the second long point rail and parallel to the 1000mm straight-strand stock rail, a first wing rail with two ends respectively connected to the 1676mm curved switch rail and the 1000mm straight-strand stock rail, and second wing rails arranged on sides opposite to the first wing rails.

**[0017]** The mixed gage turnout shall meet the following driving requirements:

#### 1. Straight strand opening

(1) A 1676mm gauge train forwardly passes through the straight strand, running successfully.

(2) The 1676mm gauge train backwardly passes through the straight strand; and when the train runs into the first and second acute turnouts, a first guard rail 14 for ensuring that a 1676mm gauge train backwardly passes through the first acute turnout during opening of a straight strand, and a second guard rail 18 for ensuring that the 1676mm gauge train backwardly passes through the second acute turnout during opening of the straight strand are arranged beside the 1676mm straight-strand stock rail to ensure the passage.

(3) A 1000mm gauge train forwardly passes through the straight strand; and when the train runs into the bidirectional obtuse turnout, a fifth guard rail 12 for ensuring that the 1000mm gauge train forwardly passes through the bidirectional obtuse turnout during the opening of the straight strand is arranged beside the common straight switch rail.

(4) A 1000mm gauge train backwardly passes through the straight strand; there is no room for disposing a guard rail between the 1000mm curved switch rail and the common straight switch rail, but the second branch frog plays a self-protection role similar to a guard rail to ensure that a train runs on the 1000mm straight-strand stock rail all the time without deflection when running into the bidirectional obtuse turnout; a third guard rail 16 for ensuring that the 1000mm gauge train backwardly passes

through the first acute turnout during the opening of the straight strand, and a fourth guard rail 19 for ensuring that the 1000mm gauge train backwardly passes through the second acute turnout during opening of the straight strand are arranged beside the 1000mm straight-strand stock rail;

## 2. Side strand opening

(1) The 1676mm gauge train forwardly passes through the side strand; and when the train runs into the bidirectional obtuse frog, the first branch frog also plays a self-protection effect.

(2) The 1676mm gauge train backwardly passes through the side strand; when the train runs into the second acute turnout, a seventh guard rail 21 is arranged beside the common curved-strand stock rail to ensure the passage; and when the train runs into the bidirectional obtuse frog, a sixth guard rail 13 is arranged beside the common curved-strand stock rail.

(3) The 1000mm gauge train forwardly passes through the side strand, running successfully.

(4) The 1000mm gauge train backwardly passes through the side strand; and when the train runs into the first acute turnout, an eighth guard rail 17 is arranged beside the common curved-strand stock rail to ensure the passage.

**[0018]** Finally, it should also be noted that the above list is only one specific embodiment of the present disclosure. Apparently, the present disclosure is not limited to the above embodiments, and there are also many variations. All modifications that can be directly derived or imagined by those of ordinary skill in the art from the content disclosed by the present disclosure should be regarded as the protection scope of the present disclosure.

## Claims

1. A mixed gage turnout with two gauges 1676 mm and 1000 mm, which is mainly composed of a switch machine and a stiff frog, wherein the switch machine comprises three fixed stock rails and three linked switch rails; the three stock rails are respectively a 1676mm straight-strand stock rail, a 1000mm straight-strand stock rail and a common curved-strand stock rail; the three switch rails are respectively a 1676mm curved switch rail, a 1000mm curved switch rail and a common straight switch rail;

the stiff frog is mainly composed of a bidirectional obtuse frog arranged at an intersection of the 1000mm straight-strand stock rail and 1676mm curved switch rail, a first end frog arranged at

an intersection of the 1000mm curved switch rail and the common straight switch rail, and a second end frog arranged at an intersection of the 1676mm curved switch rail and the common straight switch rail;

when the 1676mm curved switch rail is pulled to the 1676mm straight-strand stock rail, trains normally run on a wide-gauge 1676mm side strand and a meter-gauge 1000mm side strand; and when the common straight switch rail is pulled to the common curved-strand stock rail, trains run on a wide-gauge 1676mm straight strand and the meter-gauge 1000mm straight strand.

2. The mixed gage turnout with two gauges 1676 mm and 1000 mm according to claim 1, wherein the bidirectional obtuse turnout comprises a first long point rail connected to the 1000mm straight-strand stock rail, a first short point rail connected to the root of the first long point rail and parallel to the 1676mm curved switch rail, a second long point rail connected to a side wing rail of the first end frog facing the 1000mm straight-strand stock rail, a second short point rail connected to the root of the second long point rail and parallel to the 1000mm straight-strand stock rail, a first wing rail with two ends respectively connected to the 1676mm curved switch rail and the 1000mm straight-strand stock rail, and second wing rails arranged on sides opposite to the first wing rails.
3. The mixed gage turnout with two gauges 1676 mm and 1000 mm according to claim 2, wherein a first guard rail for ensuring that a 1676mm gauge train backwardly passes through the first acute turnout during opening of a straight strand, and a second guard rail for ensuring that the 1676mm gauge train backwardly passes through the second acute turnout during opening of the straight strand are arranged beside the 1676mm straight-strand stock rail.
4. The mixed gage turnout with two gauges 1676 mm and 1000 mm according to claim 2, wherein a third guard rail for ensuring that a 1000mm gauge train backwardly passes through the first acute turnout during the opening of the straight strand, and a fourth guard rail for ensuring that the 1000mm gauge train backwardly passes through the second acute turnout during opening of the straight strand are arranged beside the 1000mm straight-strand stock rail.
5. The mixed gage turnout with two gauges 1676 mm and 1000 mm according to claim 2, wherein a fifth guard rail for ensuring that the 1000mm gauge train forwardly passes through the bidirectional obtuse turnout during the opening of the straight strand is arranged beside the common straight switch rail.

6. The mixed gage turnout with two gauges 1676 mm and 1000 mm according to claim 2, wherein a sixth guard rail for ensuring that the 1676mm gauge train backwardly passes through the bidirectional obtuse turnout during opening of a side strand and a seventh guard rail for ensuring that the 1676mm gauge train backwardly passes through the second acute turnout, and an eighth guard rail for ensuring that the 1000mm gauge train backwardly passes through the bidirectional obtuse turnout during the opening of the side strand are arranged beside the common curved-strand stock rail.

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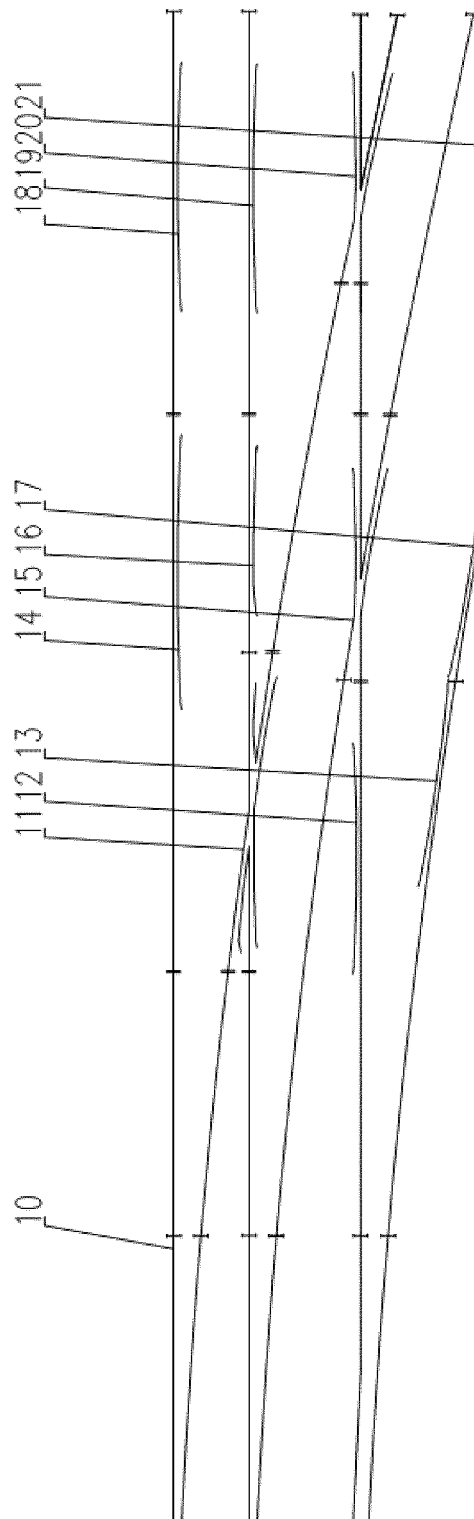


FIG. 1

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2019/125537

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> E01B 7/00(2006.01)i According to International Patent Classification (IPC) or to both national classification and IPC																						
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) E01B7 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) CNKI, VEN, CNABS, CNTXT: 轨距, 套线, 道岔, 钝角辙叉, 双向, 1676mm, 1000mm, gauge, gage, rail, overlapping line, switchblade, track switch, slip point, obtuse frog, bidirectional, two way, twoway, stock rail																						
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>																						
<table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>CN 104452487 B (HUNAN ZHONGCHUANG RAILWAY ENGINEERING EQUIPMENT CO., LTD.) 10 February 2016 (2016-02-10) description, specific embodiments, and figures 1-7</td> <td>1-6</td> </tr> <tr> <td>A</td> <td>CN 207468992 U (QINHUANGDAO SHANHAIGUAN WORKS EQUIPMENT CO., LTD.) 08 June 2018 (2018-06-08) entire document</td> <td>1-6</td> </tr> <tr> <td>A</td> <td>CN 209368595 U (QINHUANGDAO SHANHAIGUAN WORKS EQUIPMENT CO., LTD.) 10 September 2019 (2019-09-10) entire document</td> <td>1-6</td> </tr> <tr> <td>A</td> <td>CA 2167133 A1 (ABC RAIL PRODUCTS CORP) 22 August 1996 (1996-08-22) entire document</td> <td>1-6</td> </tr> <tr> <td>A</td> <td>US 4469299 A (CSONTOS IMRE) 04 September 1984 (1984-09-04) entire document</td> <td>1-6</td> </tr> <tr> <td>A</td> <td>US 9669847 B2 (RAIL POD INCORPORATED et al.) 06 June 2017 (2017-06-06) entire document</td> <td>1-6</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	A	CN 104452487 B (HUNAN ZHONGCHUANG RAILWAY ENGINEERING EQUIPMENT CO., LTD.) 10 February 2016 (2016-02-10) description, specific embodiments, and figures 1-7	1-6	A	CN 207468992 U (QINHUANGDAO SHANHAIGUAN WORKS EQUIPMENT CO., LTD.) 08 June 2018 (2018-06-08) entire document	1-6	A	CN 209368595 U (QINHUANGDAO SHANHAIGUAN WORKS EQUIPMENT CO., LTD.) 10 September 2019 (2019-09-10) entire document	1-6	A	CA 2167133 A1 (ABC RAIL PRODUCTS CORP) 22 August 1996 (1996-08-22) entire document	1-6	A	US 4469299 A (CSONTOS IMRE) 04 September 1984 (1984-09-04) entire document	1-6	A	US 9669847 B2 (RAIL POD INCORPORATED et al.) 06 June 2017 (2017-06-06) entire document	1-6	
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	Date of mailing of the international search report <b>27 July 2020</b>																					
Name and mailing address of the ISA/CN <b>China National Intellectual Property Administration (ISA/CN)</b> <b>No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088</b> <b>China</b> Facsimile No. (86-10)62019451	Authorized officer    Telephone No.																					

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**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.

**PCT/CN2019/125537**

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**REFERENCES CITED IN THE DESCRIPTION**

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