

# (12) 按照专利合作条约所公布的国际申请

(19) 世界知识产权组织  
国际局

(43) 国际公布日  
2023 年 8 月 3 日 (03.08.2023)



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**E01B 2/00** (2006.01)

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(26) 公布语言: 中文

(30) 优先权:  
63/303,000 2022年1月25日 (25.01.2022) US  
63/331,029 2022年4月14日 (14.04.2022) US

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(81) 指定国(除另有指明, 要求每一种可提供的国家保护): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE,

(54) Title: MOTION MECHANISM OF RAILWAY AND STEEL WHEEL TYPE TRAIN

(54) 发明名称: 钢轨铁路钢轮火车的运动机构

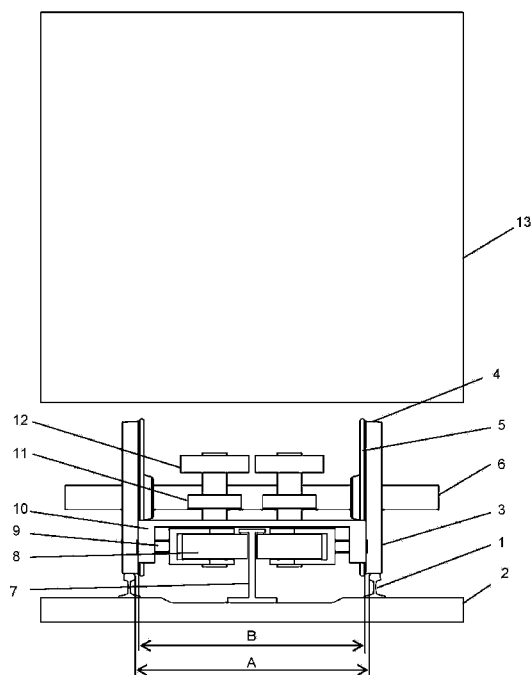


图 1

(57) Abstract: A motion mechanism of a railway and steel wheel train of the present invention comprises traditional steel rails, one or two auxiliary rails, a traditional train, and derailment-preventing claws on the train. The derailment-preventing claws hold the auxiliary rail or the auxiliary rail holds the derailment-preventing claws, so as to form a non-derailment structure, such that the train cannot be derailed unless the rails and the train are destroyed in advance. Furthermore, the derailment-preventing claws are replaced by or additionally provided with: 1) a horizontal guide wheel, a horizontal driving wheel and a horizontal brake wheel; 2) an auxiliary rail brake block; 3) the auxiliary rail brake block and a buffer wheel; 4) a linear eddy-current brake assembly; and 5) a driving and a braking assembly of a linear electric motor. Therefore, the train can obtain the performances of rapid acceleration, rapid deceleration, rapid ascending, rapid descending, and rapid turning; the shape of steel wheel treads is improved; the serpentine motion is eliminated; a limit speed of the railway train is increased; the train can also smoothly pass through a turnout, a diamond crossing and a level crossing; and the temperature stress of the steel rails is reduced. The present invention is suitable for high-speed passenger transport and heavy-load freight transport.

PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE,  
SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ,  
UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW。

(84) 指定国 (除另有指明, 要求每一种可提供的地区  
保护): ARIPO (BW, CV, GH, GM, KE, LR, LS, MW,  
MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), 欧  
亚 (AM, AZ, BY, KG, KZ, RU, TJ, TM), 欧洲 (AL, AT,  
BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR,  
HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL,  
NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ,  
CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE,  
SN, TD, TG)。

根据细则4.17的声明:

— 发明人资格 (细则4.17(iv))

本国际公布:

— 包括国际检索报告 (条约第21条(3))。  
— 在修改权利要求的期限届满之前进行, 在收到该  
修改后将重新公布 (细则48.2(h))。

(88) 国际检索报告公布日期:

2023年9月21日 (21.09.2023)

(57) 摘要: 本发明的钢轨铁路钢轮火车的运动机构, 包括传统钢轨、一条或两条辅助轨、传统车辆和车辆上的脱轨防止爪。脱轨防止爪拥抱辅助轨或辅助轨拥抱脱轨防止爪, 形成不脱轨的结构, 在轨道和火车没有事先破坏的情况下, 火车不可能脱轨。进一步, 将脱轨防止爪, 置换成或增加 1) 水平导向轮、水平驱动轮、水平制动轮, 2) 辅助轨制动块, 3) 辅助轨制动块加缓冲轮, 4) 线性涡流制动组件, 5) 直线电机的驱动和制动组件; 使得火车获得急加速、急减速、急上坡、急下坡、急转弯性能; 改进了钢轮踏面形状, 消除了蛇形运动, 提高了铁路火车的极限速度, 还能顺利通过道岔、菱形交叉、道口, 降低了钢轨的温度应力, 适合于高速客运, 重载货运。

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2023/070021

**A. CLASSIFICATION OF SUBJECT MATTER**

E01B25/00(2006.01)i; E01B2/00(2006.01)i; E01B5/18(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)

IPC: E01B

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)

CNTXT, ENTXTC, VEN, CNKI: 轨, 辅助轨, 防脱轨, 道岔, 滚动, 轮, 供电, 接缝, 制动, 驱动, 缓冲, 摩擦, 挤压, 间隙, 导向, 公差, 惯性, rail, auxiliary rail, anti-derail, turnout, rolling, wheel, power supply, seam, brake, drive, buffer, friction, extrusion, gap, guide, tolerance, inertia

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                             | Relevant to claim No. |
|-----------|--------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| X         | CN 201924244 U (ZHANG, Falin) 10 August 2011 (2011-08-10)<br>description, paragraphs 0019-0046 and 0075-0094, and figures 1-26 | 1-3, 19, 22           |
| X         | CN 107380008 A (YU, Xuelu) 24 November 2017 (2017-11-24)<br>description, "particular embodiments", and figures 1-8             | 1-3, 19, 22           |
| X         | JP 2008024126 A (TERASONO KYUICHIRO) 07 February 2008 (2008-02-07)<br>description, "particular embodiments", and figures 1-14  | 1-3, 19, 22           |
| A         | CN 107380008 A (YU, Xuelu) 24 November 2017 (2017-11-24)<br>entire document                                                    | 4-18, 20-21, 23-26    |
| A         | CN 106480789 A (HAO, Wenwen) 08 March 2017 (2017-03-08)<br>entire document                                                     | 1-26                  |
| A         | CN 113029613 A (BEIJING JIAOTONG UNIVERSITY) 25 June 2021 (2021-06-25)<br>entire document                                      | 1-26                  |
| A         | CN 201924244 U (ZHANG, Falin) 10 August 2011 (2011-08-10)<br>entire document                                                   | 4-18, 20-21, 23-26    |



Further documents are listed in the continuation of Box C.



See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"D" document cited by the applicant in the international application

"E" earlier application or patent but published on or after the international filing date

"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)

"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

"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

Date of the actual completion of the international search

02 August 2023

Date of mailing of the international search report

03 August 2023

Name and mailing address of the ISA/CN

China National Intellectual Property Administration (ISA/  
CN)  
China No. 6, Xitucheng Road, Jimenqiao, Haidian District,  
Beijing 100088

Authorized officer

Telephone No.

## INTERNATIONAL SEARCH REPORT

International application No.

**PCT/CN2023/070021**

### C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages    | Relevant to claim No. |
|-----------|---------------------------------------------------------------------------------------|-----------------------|
| A         | JP 2008024126 A (TERASONO KYUICHIRO) 07 February 2008 (2008-02-07)<br>entire document | 4-18, 20-21, 23-26    |

**Box No. III      Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

Claim 1 and relevant dependent claims thereof relate to the technical solution which mainly relates to a derailment prevention horizontal claw.

Claims 4, 5 and 8 and relevant dependent claims thereof relate to the technical solution which mainly relates to an auxiliary rail action assembly.

Claim 15 and relevant dependent claims thereof relate to the technical solution which mainly relates to a horizontal guide wheel of a main steel rail.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☒ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

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

International application No.

**PCT/CN2023/070021**

| Patent document<br>cited in search report |            |   | Publication date<br>(day/month/year) | Patent family member(s) | Publication date<br>(day/month/year) |
|-------------------------------------------|------------|---|--------------------------------------|-------------------------|--------------------------------------|
| CN                                        | 201924244  | U | 10 August 2011                       | None                    |                                      |
| CN                                        | 107380008  | A | 24 November 2017                     | None                    |                                      |
| JP                                        | 2008024126 | A | 07 February 2008                     | None                    |                                      |
| CN                                        | 106480789  | A | 08 March 2017                        | None                    |                                      |
| CN                                        | 113029613  | A | 25 June 2021                         | None                    |                                      |

## 国际检索报告

国际申请号

PCT/CN2023/070021

## A. 主题的分类

E01B25/00(2006.01)i; E01B2/00(2006.01)i; E01B5/18(2006.01)i

按照国际专利分类(IPC)或者同时按照国家分类和IPC两种分类

## B. 检索领域

检索的最低限度文献(标明分类系统和分类号)

IPC: E01B

包含在检索领域中的除最低限度文献以外的检索文献

在国际检索时查阅的电子数据库(数据库的名称, 和使用的检索词(如使用))

CNTXT, ENTXTC, VEN, CNKI: 轨, 辅助轨, 防脱轨, 道岔, 滚动, 轮, 供电, 接缝, 制动, 驱动, 缓冲, 摩擦, 挤压, 间隙, 导向, 公差, 惯性, rail, auxiliary rail, anti-derail, turnout, rolling, wheel, power supply, seam, brake, drive, buffer, friction, extrusion, gap, guide, tolerance, inertia

## C. 相关文件

| 类 型* | 引用文件, 必要时, 指明相关段落                                                                    | 相关的权利要求            |
|------|--------------------------------------------------------------------------------------|--------------------|
| X    | CN 201924244 U (张发林) 2011年8月10日 (2011 - 08 - 10)<br>说明书第0019-0046、0075-0094段及图1-26   | 1-3, 19, 22        |
| X    | CN 107380008 A (于学禄) 2017年11月24日 (2017 - 11 - 24)<br>说明书“具体实施方式”及图1-8                | 1-3, 19, 22        |
| X    | JP 2008024126 A (TERASONO KYUICHIRO) 2008年2月7日 (2008 - 02 - 07)<br>说明书“具体实施方式”及图1-14 | 1-3, 19, 22        |
| A    | CN 107380008 A (于学禄) 2017年11月24日 (2017 - 11 - 24)<br>全文                              | 4-18, 20-21, 23-26 |
| A    | CN 106480789 A (郝雯文) 2017年3月8日 (2017 - 03 - 08)<br>全文                                | 1-26               |
| A    | CN 113029613 A (北京交通大学) 2021年6月25日 (2021 - 06 - 25)<br>全文                            | 1-26               |
| A    | CN 201924244 U (张发林) 2011年8月10日 (2011 - 08 - 10)<br>全文                               | 4-18, 20-21, 23-26 |

☒ 其余文件在C栏的续页中列出。☒ 见同族专利附件。

\* 引用文件的具体类型:

“A” 认为不特别相关的表示了现有技术一般状态的文件

“D” 申请人在国际申请中引证的文件

“E” 在国际申请日的当天或之后公布的在先申请或专利

“L” 可能对优先权要求构成怀疑的文件, 或为确定另一篇引用文件的公布日而引用的或者因其他特殊理由而引用的文件(如具体说明的)

“O” 涉及口头公开、使用、展览或其他方式公开的文件

“P” 公布日先于国际申请日但迟于所要求的优先权日的文件

“T” 在申请日或优先权日之后公布, 与申请不相抵触, 但为了理解发明之理论或原理的在后文件

“X” 特别相关的文件, 单独考虑该文件, 认定要求保护的发明不是新颖的或不具有创造性

“Y” 特别相关的文件, 当该文件与另一篇或者多篇该类文件结合并且这种结合对于本领域技术人员为显而易见时, 要求保护的发明不具有创造性

“&amp;” 同族专利的文件

国际检索实际完成的日期

2023年8月2日

国际检索报告邮寄日期

2023年8月3日

ISA/CN的名称和邮寄地址

中国国家知识产权局

中国北京市海淀区蓟门桥西土城路6号 100088

受权官员

周冬

电话号码 (+86) 010-62084880



第III栏 缺乏发明单一性的意见(续第I页第3项)

本国际检索单位在该国际申请中发现多项发明，即：

权利要求1及其相关从属权利要求涉及脱轨防止水平爪为主的技术方案。

权利要求4、5、8及其相关从属权利要求涉及辅助轨作用组件为主的技术方案。

权利要求15及其相关从属权利要求涉及主钢轨的水平导向轮为主的技术方案。

1. ☐ 由于申请人按时缴纳了被要求缴纳的全部附加检索费，本国际检索报告涉及全部可作检索的权利要求。
2. ☒ 由于无需付出有理由要求附加费的劳动即能对全部可检索的权利要求进行检索，本单位未通知缴纳任何加费。
3. ☐ 由于申请人仅按时缴纳了部分被要求缴纳的附加检索费，本国际检索报告仅涉及已缴费的那些权利要求，具体地说，是权利要求：
4. ☐ 申请人未按时缴纳被要求缴纳的附加检索费。因此，本国际检索报告仅涉及权利要求书中首先提及的发明；包含该发明的权利要求是：

对异议的意见

☐ 申请人缴纳了附加检索费，同时提交了异议书，适用时，缴纳了异议费。

☐ 申请人缴纳了附加检索费，同时提交了异议书，但未在通知书规定的时间期限内缴纳异议费。

☐ 缴纳附加检索费时未提交异议书。

国际检索报告  
关于同族专利的信息

国际申请号

PCT/CN2023/070021

| 检索报告引用的专利文件 |            |   | 公布日<br>(年/月/日) | 同族专利 | 公布日<br>(年/月/日) |
|-------------|------------|---|----------------|------|----------------|
| CN          | 201924244  | U | 2011年8月10日     | 无    |                |
| CN          | 107380008  | A | 2017年11月24日    | 无    |                |
| JP          | 2008024126 | A | 2008年2月7日      | 无    |                |
| CN          | 106480789  | A | 2017年3月8日      | 无    |                |
| CN          | 113029613  | A | 2021年6月25日     | 无    |                |