

## (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  
2014年2月13日 (13.02.2014)



(10) 国际公布号  
WO 2014/023253 A1

- (51) 国际专利分类号:  
F16B 41/00 (2006.01) F16B 37/00 (2006.01)  
F16B 43/00 (2006.01)
- (21) 国际申请号: PCT/CN2013/081111
- (22) 国际申请日: 2013年8月8日 (08.08.2013)
- (25) 申请语言: 中文
- (26) 公布语言: 中文
- (30) 优先权:  
201220390953.X 2012年8月8日 (08.08.2012) CN
- (71) 申请人: 中兴通讯股份有限公司 (ZTE CORPORATION) [CN/CN]; 中国广东省深圳市南山区高新技术产业园科技南路中兴通讯大厦, Guangdong 518057 (CN)。
- (72) 发明人: 陈善军 (CHEN, Shanjun); 中国广东省深圳市南山区高新技术产业园科技南路中兴通讯大厦, Guangdong 518057 (CN)。 李旭 (LI, Xu); 中国广东省深圳市南山区高新技术产业园科技南路中兴通讯大厦, Guangdong 518057 (CN)。
- (74) 代理人: 北京康信知识产权代理有限责任公司 (KANGXIN PARTNERS, P.C.); 中国北京市海淀区

知春路甲48号盈都大厦A座16层, Beijing 100098 (CN)。

(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, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, 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, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, 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, 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)。

本国际公布:

— 包括国际检索报告(条约第21条(3))。

(54) Title: ANTI-DROPPING DEVICE AND CONNECTING PIECE

(54) 发明名称: 防掉落装置以及连接件

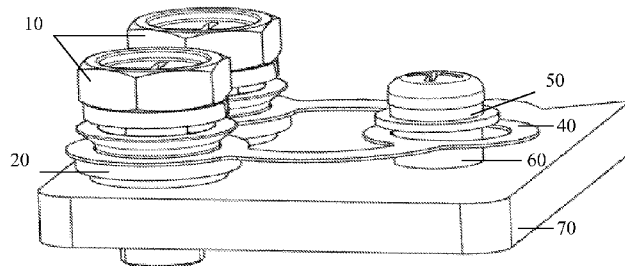


图2 / Fig. 2

(57) Abstract: An anti-dropping device and connecting piece, the anti-dropping device comprising a connecting piece (40) and an anti-dropping boss (60); the connecting piece (40) comprises: a first hole (42) fitted with the cross section of the anti-drop boss (60) and used to rotatably nest the connecting piece (40) on the anti-drop boss (60); at least one second hole (44) used to rotatably nest a bolt (10) in the connecting piece (40); and at least one connecting part (46). The two ends of the connecting part (46) are respectively connected to the first hole (42) and the second hole (44); one end of the anti-drop boss (60) is fixed on a device (70) to hold the connecting piece (40) on the device (70). The present invention solves the problem of dropping bolts during use due to inconvenient anti-dropping operation in the relevant art, thus facilitating operation and ensuring good safety during use of bolts.

(57) 摘要: 一种防掉落装置以及连接件, 其中, 该防掉落装置包括连接件(40)和防掉凸台(60), 连接件(40)包括: 第一孔(42), 与防掉凸台(60)的横截面相适配, 用于将连接件(40)可旋转地嵌套在防掉凸台(60)上; 至少一个第二孔(44), 用于将螺钉(10)可旋转地嵌套在连接件(40)中; 至少一个连接部(46), 该连接部(46)的两端分别连接至第一孔(42)和第二孔(44); 防掉凸台(60)的一端固定在设备(70)上, 用于将连接件(40)固定至设备(70)上。其解决了相关技术中防掉落方案操作不便, 螺钉在使用的过程中掉落的问题, 使螺钉使用过程操作方便且安全性强。



WO 2014/023253 A1

## 防掉落装置以及连接件

### 技术领域

本实用新型涉及装配领域，具体而言，涉及一种防掉落装置以及连接件。

### 背景技术

5 螺钉作为标准件，能方便、快速、可靠的实现不同零件之间的联接，目前各种领域中模块、设备的紧固和安装都大量的使用了螺钉等紧固件。由于受到零件安装顺序的限制，很多零件的安装需要在高空中进行，这就要求在使用螺钉时或者安装完成后要防止其掉落。目的防止螺钉掉下来伤人，或掉落后难以找到，且还需爬高重新安装。

10 已有螺钉的防掉落方案有的采用弹性件套在螺钉之间，有的采用弹性件将螺钉与单独的防掉件套在一起，通过该单独的防掉件实现防掉功能。这些方式存在的缺陷有：弹性件会在螺钉安装打紧的过程中旋转；弹性件可能发生直接折弯；防掉件需要单独设计；防掉件与弹性件之间存在卡死或过紧的情况，最终导致了操作不便或失效。

针对相关技术中的防掉落方案操作不便的问题，目前尚未提出有效的解决方案。

### 实用新型内容

15 针对相关技术中的防掉落方案操作不便的问题，本实用新型实施例提供了一种防掉落装置以及连接件，以至少解决上述问题之一。

20 根据本实用新型实施例的一个方面，提供了一种防掉落装置，包括连接件 40 和防掉凸台 60，其中，所述连接件 40 包括：第一孔 42，与所述防掉凸台 60 的横截面相适配，设置为将连接件 40 可旋转地嵌套在所述防掉凸台 60 上；至少一个第二孔 44，设置为将螺钉 10 可旋转地嵌套在连接件 40 中；至少一个连接部 46，该连接部 46 的两端分别连接至第一孔 42 和第二孔 44；所述防掉凸台 60 的一端固定在设备 70 上，设置为将所述连接件 40 固定至设备 70 上。

优选地，所述防掉凸台 60 是与所述设备 70 一体加工形成的。

25 优选地，还包括：固定件 50，设置为固定在所述防掉凸台 60 远离所述设备 70 的一端，所述固定件 50 上设置有环形凸沿，所述环形凸沿的半径大于所述第一孔 42 的半径。

优选地，所述连接部 46 呈圆弧形。

优选地，所述第一孔 42 为腰型孔，和/或，所述第二孔 44 为腰型孔。

5 优选地，所述装置还包括：轴套 20，通过所述第二孔 44 嵌套在所述连接件 40 中，设置为固定在所述螺钉 10 的外表面上，其中，所述轴套 20 靠近所述设备 70 一端的外半径大于所述第二孔 44 的半径。

优选地，所述轴套 20 远离所述设备 70 一端的外半径能够延展至大于所述第二孔 44 的半径。

优选地，所述轴套 20 的内壁设置有螺纹，所述轴套 20 通过螺纹旋转至所述螺钉 10 的无螺纹部位固定。

10 优选地，通过所述螺钉 10 的螺纹加工将所述轴套 20 固定在所述螺钉 10 的无螺纹部位。

优选地，所述轴套 20，在所述第二孔 44 套在所述螺钉 10 上后固定在所述螺钉 10 的外表面上，其中，所述轴套 20 靠近所述设备 70 一端的外半径大于所述第二孔 44 的半径。

15 根据本实用新型实施例的另一方面，提供了一种连接件 40，包括：第一孔 42，与防掉凸台 60 的横截面相适配，设置为将连接件 40 可旋转地嵌套在所述防掉凸台 60 上，其中，所述防掉凸台 60 固定在设备 70 上；至少一个第二孔 44，设置为可旋转地嵌套螺钉 10；至少一个连接部 46，所述连接部 46 的两端分别连接至所述第一孔 42 和所述第二孔 44。

20 通过本实用新型实施例，采用防掉落装置，该装置包括连接件 40 和防掉凸台 60，连接件 40 包括：第一孔 42，与防掉凸台 60 的横截面相适配，设置为将连接件 40 可旋转地嵌套在防掉凸台 60 上；至少一个第二孔 44，设置为将螺钉 10 可旋转地嵌套在连接件 40 中；至少一个连接部 46，该连接部 46 的两端分别连接至第一孔 42 和第二孔 44；防掉凸台 60 的一端固定在设备 70 上，设置为将连接件 40 固定至设备 70 上，  
25 解决了相关技术中防掉落方案操作不便，螺钉在使用的过程中掉落的问题，使螺钉使用过程操作方便且安全性强。

## 附图说明

此处所说明的附图用来提供对本实用新型的进一步理解，构成本申请的一部分，本实用新型的示意性实施例及其说明用于解释本实用新型，并不构成对本实用新型的不当限定。在附图中：

- 5 图 1 是根据本实用新型实施例的优选连接件的示意图；  
图 2 是根据本实用新型实施例的优选防掉落装置的整体示意图；  
图 3 是根据本实用新型实施例的组合螺钉优选示意图；  
图 3a 是根据本实用新型实施例的组合螺钉优选示意图二；  
图 4 是根据本实用新型实施例的优选轴套的示意图；  
10 图 5 是根据本实用新型实施例的优选连接件安装示意图；  
图 6 是根据本实用新型实施例的优选连接件安装示意图二。

## 具体实施方式

下文中将参考附图并结合实施例来详细说明本实用新型。需要说明的是，在不冲突的情况下，本申请中的实施例及实施例中的特征可以相互组合。

- 15 在本实施例中提供了一种连接件 40，图 1 是根据本实用新型实施例的优选连接件 40 的示意图，图 2 是根据本实用新型实施例的优选防掉落装置的整体示意图，如图 1 和 2 所示，该连接件 40 包括：

第一孔 42，与防掉凸台 60 的横截面相适配，设置为将连接件 40 可旋转地嵌套在防掉凸台 60 上，其中，该防掉凸台 60 固定在设备 70 上；

- 20 至少一个第二孔 44，设置为可旋转地嵌套螺钉（10）；

至少一个连接部 46，该连接部 46 的两端分别连接至第一孔 42 和第二孔 44。优选地，该连接件 40 可以是弹性件。

- 25 本实施例通过上述部件，通过第一孔 42 与设备 70 上的防掉凸台 60 的嵌套，将连接件 40 固定在设备 70 上，并通过连接件 40 上的至少一个第二孔 44，将螺钉 10 嵌套在连接件 40 中，从而使得螺钉 10 在使用过程中难以从连接件 40 中脱出，实现了防掉

落功能，并且，（由于连接件 40 嵌套固定在设备 70 上，从而使得在螺钉 10 的使用过程中，不会由于连接件 40 的颤动导致螺钉 10 跟随连接件 40 旋转，从而防止了螺钉 10 的旋转和脱落。解决了相关技术中防掉落方案操作不便，螺钉在使用的过程中掉落的问题，使螺钉使用过程操作方便且安全性强。

5 优选地，图 3 是根据本实用新型实施例的组合螺钉优选示意图，如图 3 所示，上述螺钉 10 可以是组合螺钉，该组合螺钉包括单独的螺钉 12 和弹簧垫圈 30。图 3a 根据本实用新型实施例的组合螺钉优选示意图二，与图 3 的不同之处在于，该组合螺钉包括单独的螺钉 12 和弹簧垫圈 30 及平垫圈 31。

10 作为一种优选实施方式，参考图 1 和图 2 所示，上述连接部 46 可以呈圆弧形。通过这种方式，在螺钉 10 沿连接件 40 平面的垂直方向移动时，可以将加在连接部 46 上的垂直方向的力扩散到该连接部 46 的两端，从而能够防止连接部 46 发生直接折弯，提高了连接件 40 的使用寿命。

优选地，上述第一孔 42 可以为腰型孔，上述第二孔 44 也可以为腰型孔。

15 作为一种优选实施方式，还可以在上述每个第二孔 44 中分别嵌套一个轴套 20。图 4 是根据本实用新型实施例的优选轴套 20 的示意图，图 5 是根据本实用新型实施例的优选连接件安装示意图，如图 4 和 5 所示，轴套 20 可以通过第二孔 44 嵌套在连接件 40 上，该轴套 20 靠近设备 70 一端的外半径大于螺钉孔 44 的半径，该轴套 20 可以固定在螺钉 10 上，以防止螺钉 10 从连接件 40 中脱落。通过这种方式，由于轴套 40 嵌套在第二孔 44 中，并且轴套 20 靠近设备 70 一端的外半径大于第二孔 44 的半径，  
20 从而使得轴套 20 很难从连接件中脱出，而且轴套 20 又固定在螺钉 10 上，使螺钉 10 在使用过程中更加难以从连接件 40 中脱出，提高了防掉落效果。并且由于轴套 20 的存在，使得连接件 40 与螺钉 10 的表面实现了脱离，从而使得连接件 40 与螺钉 10 在转动过程中不会相互跟随，并且连接件 40 可以针对多种型号的螺钉 10 实现防掉落功能，避免了连接件 40 需要单独设计，提高了连接件 40 的适用范围。

25 优选地，参考图 4 和图 5 所示，在轴套 20 通过第二孔 44 嵌套在连接件 40 上的情况下，轴套远离设备 70 一端的外半径能够延展至大于第二孔 44 的半径。通过这种方式，使螺钉 10 无论在向上移动还是向下移动的过程中，均不会从连接件 40 中脱出，进一步提高了防掉落效果。

为了实现轴套 20 在螺钉 10 上的固定，本实施例中给出了如下两种优选实施方式：

方式一，可以在轴套 20 的内壁设置螺纹，从而使轴套 20 通过螺纹旋转至螺钉 10 的无螺纹部位，起到固定位置的效果。

方式二，也可以不在轴套 20 的内壁设置螺纹，例如，可以在螺钉 10 的加工过程中，先将轴套 20 套在螺钉 10 的无螺纹部分，然后再对螺钉 10 进行螺纹加工，从而将轴套 20 固定在螺钉 10 的无螺纹部位，同样也能够起到固定位置的效果。

在本实施例中还提供了一种防掉落装置，参考图 2 所示，该防掉落装置包括上述连接件 40 和防掉凸台 60，连接件 40 包括：第一孔 42，与防掉凸台 60 的横截面相适配，设置为将连接件 40 可旋转地嵌套在防掉凸台 60 上；至少一个第二孔 44，设置为将螺钉 10 可旋转地嵌套在连接件 40 中；至少一个连接部 46，该连接部 46 的两端分别连接至第一孔 42 和第二孔 44；防掉凸台 60 的一端固定在设备 70 上，设置为将连接件 40 固定至设备 70 上。

本实施例通过上述部件，通过第一孔 42 与设备 70 上的防掉凸台 60 的嵌套，将连接件 40 固定在设备 70 上，并通过连接件 40 上的至少一个第二孔 44，将螺钉 10 嵌套在连接件 40 中，从而使得螺钉 10 在使用过程中难以从连接件 40 中脱出，实现了防掉落功能，并且，（由于连接件 40 嵌套固定在设备 70 上，从而使得在螺钉 10 的使用过程中，不会由于连接件 40 的颤动导致螺钉 10 跟随连接件 40 旋转，从而防止了螺钉 10 的旋转和脱落。解决了相关技术中防掉落方案操作不便，螺钉在使用的过程中掉落的问题，使螺钉使用过程操作方便且安全性强。并且，由于防掉凸台 60 的存在，使得连接件 40 与设备 70 之间存在一定空间，从而避免了连接件 40 存在卡死或过紧的情况，进一步方便了螺钉 10 安装过程中的操作。

优选地，防掉凸台 60 可以通过紧固的方式固定在设备 70 上，或者也可以与设备 70 一体加工形成。这种方式易于实现。

在实施过程中，将连接件 40 嵌套在防掉凸台 60 上的方式有很多种，例如，由于连接件 40 是弹性部件，可以将防掉凸台 60 远离设备 70 一端的端口处的半径设置成略大于第一孔 42 的半径，这样，在用户加力将连接件 40 嵌套至防掉凸台 60 上后，连接件 40 不易再从该端口处脱出，实现了将连接件 40 嵌套在防掉凸台 60 上的效果，但是这种方式会随着连接件 40 弹性性能的不同而导致嵌套不便。在本实施例中还提供了另一种优选实施方式，如图 2 所示，防掉凸台 60 呈柱状，在将连接件 40 套入防掉凸台 60 上后，将固定件 50 在该防掉凸台 60 远离设备 70 的一端固定，由于固定件 50 上设置有环形凸沿，该凸沿的半径大于第一孔 42 的半径，因此在将固定件 50 固定完成后，也能够实现将连接件 40 嵌套在防掉凸台 60 上的效果，并且这种嵌套方式不会因为连

接件 40 的弹性性能不同而导致连接件 40 无法嵌套进防掉凸台 60 中,提升了本方案的适用范围。其中,该固定件 50 可以是螺钉、铆钉等。

下面结合优选实施例进行说明,以下优选实施例结合了上述实施例及其优选实施方式。

## 5 实施例一

本优选实施例提供了一种螺钉的防掉落方案,例如在高空中对零件安装时避免螺钉的掉落的情况,当然也可以扩展到其他领域相关方面的使用。

10 该螺钉防掉方案通过轴套的转接解决了连接件与螺钉配合处在螺钉打紧时的转动,通过将连接件直接套设在设备上设计的防掉凸台之上,解决高空中零件安装时螺钉掉落的问题。同时该方案提高了安装过程中的简便性和可靠性。

15 该螺钉防掉方案可以包括:组合螺钉 10(包括单独的螺钉 12 和弹簧垫圈 30)、轴套 20、连接件 40、固定件 50。其中,弹簧垫圈 30 安装在螺钉 12 上,组成组合螺钉 10;轴套 20 安装在组合螺钉 10 上,并与连接件 40 的一端装配;连接件 40 的另一端直接套设在设备 70 的防掉凸台 60 上,然后固定件 50 固定在设备 70 上的防掉凸台 60 上,这样就实现了组合螺钉 10 的防掉功能。通过轴套 20 将组合螺钉 10 与连接件 40 连接的方式,可以防止组合螺钉 10 打紧的过程中连接件 40 的旋转。

连接件 40 可以为弹性件(例如,塑胶件),其一端的第二孔套在轴套 20 上凸缘的位置,然后对轴套 20 的凸缘端进行扩口,防止连接件 40 脱落。连接件 40 上可以设置多个与轴套 20 第二孔 44,用以实现不同个数螺钉的防掉方案。

20 连接件 40 与轴套 20 第二孔 44 的孔径以及与固定件 50 第一孔 42 的孔径可以根据需要增大或设置成为腰型孔,使连接件 40 套设到防掉凸台后,组合螺钉 10 可以活动的空间更大,保证安装操作更顺畅。

连接件 40 上连接第二孔之间的部分(即上述连接部 46)可以设置成圆弧型,这样在固定件 50 和组合螺钉 10 都安装后,能够有效避免连接件 40 发生直接折弯。

25 轴套 20 与组合螺钉 10 配合的内壁上可以设置螺纹,螺纹尺寸同组合螺钉 10 的螺纹规格,装配时,旋过组合螺钉 10 的螺纹部分到光杆部分,能防止轴套的脱落。轴套 20 与组合螺钉 10 配合的内壁上也可以不设计螺纹,例如,在组合螺钉 10 的螺纹加工之前,进行轴套 20 与组合螺钉 10 的装配,然后再进行组合螺钉 10 的螺纹加工,从而实现轴套 20 不脱落。

固定件 50 固定连接件 40 的一端在设备的防掉凸台 60 之上，固定件 50 可以采用螺钉、铆钉等，形式多样。

采用螺钉防掉方案方案能够具有以下进步和效果：安装维护方便；结构简单，易操作；易生产，成本低廉；通用性高。

## 5 实施例二

如图 2 所示，轴套 20 通过螺纹或其它方式实现与组合螺钉 10 的装配，保证装配后轴套 20 不会脱落。连接件 40 上另一端的第一孔 42 套在设备上设置的防掉凸台 60 上，然后将固定件 50 固定在防掉凸台 60 之上，防止连接件 40 从该端脱出，这样就实现了组合螺钉 10 在拆卸时的防脱落设计。

10 如图 3 所示，螺钉 12、弹簧垫圈 30 形成组合螺钉 10，螺钉 12 上设置有一段光杆，光杆上装配弹簧垫圈 30。或者如图 3a 所示，螺钉 12、弹簧垫圈 30 及平弹垫 31 形成组合螺钉 10，螺钉 12 上设置有一段光杆，光杆上装配弹簧垫圈 30 及平弹垫 31。

15 如图 5 所示，将连接件 40 一端的第二孔 44 套在轴套 20 上凸缘的位置，然后对轴套 20 的凸缘端进行扩口，防止连接件 40 脱落。一个连接件 40 可以设计与多个轴套 20 进行配合，用以实现多个螺钉防掉的需求。

如图 4 所示，轴套 20 可以设置成带凸缘的结构，依据与组合螺钉 10 的配合形式，轴套 20 中间的过孔可以设计成有螺纹结构，也可以设计成无螺纹结构。

20 如图 1 所示，连接件 40，其上与轴套 20 第二孔 44 的孔径以及与固定件 50 第一孔 42 的孔径根据需要可以增大或设置成腰型孔，这样有利于在套设到防掉凸台 60 后，使组合螺钉 10 有更大的活动空间。连接件 40 上第二孔之间的部分可以设置成圆弧型，防止组合螺钉 10 安装后连接件 40 发生直接折弯。另外，连接件 40 的材质也可以更换为其他有弹性的材料。

## 实施例三

25 如图 4 所示，轴套 20 可以设置成不带凸缘的结构，依据与组合螺钉 10 的配合形式，轴套 20 中间的过孔可以设计成有螺纹结构，也可以设计成无螺纹结构。

如图 3 所示，螺钉 12、弹簧垫圈 30 形成组合螺钉 10，螺钉 12 上设置有一段光杆，光杆上装配弹簧垫圈 30。或如图 3a 所示，螺钉 12、弹簧垫圈 30 及平垫圈 31 形成组合螺钉 10，螺钉 12 上设置有一段光杆，光杆上装配弹簧垫圈 30 及平垫圈 31。

图 6 是根据本实用新型实施例的优选连接件安装示意图二，如图 6、图 2 所示，将连接

件 40 一端的第二孔 44 套在组合螺钉 10 的光杆部分，然后将轴套 20 通过螺纹或其它方式实现与组合螺钉 10 的装配，保证装配后轴套 20 不会脱落。然后将连接件 40 上另外一端的第一孔 42 套在设备上设置的防掉凸台 60 上，然后将固定件 50 固定在防掉凸台 60 之上，防止连接件 40 从该端脱出，这样就实现了组合螺钉 10 在拆卸时的防脱落设计。

- 5 以上所述仅为本实用新型的优选实施例而已，并不用于限制本实用新型，对于本领域的技术人员来说，本实用新型可以有各种更改和变化。凡在本实用新型的精神和原则之内，所作的任何修改、等同替换、改进等，均应包含在本实用新型的保护范围之内。

## 权利要求书

1. 一种防掉落装置，包括连接件（40）和防掉凸台（60），其中，

所述连接件（40）包括：第一孔（42），与所述防掉凸台（60）的横截面相适配，设置为将连接件（40）可旋转地嵌套在所述防掉凸台（60）上；至少一个第二孔（44），设置为将螺钉（10）可旋转地嵌套在连接件（40）中；至少一个连接部（46），该连接部（46）的两端分别连接至第一孔（42）和第二孔（44）；

所述防掉凸台（60）的一端固定在设备（70）上，设置为将所述连接件（40）固定至设备（70）上。
2. 根据权利要求1所述的防掉落装置，其中，所述防掉凸台（60）是与所述设备（70）一体加工形成的。
3. 根据权利要求1所述的装置，其中，还包括：

固定件（50），设置为固定在所述防掉凸台（60）远离所述设备（70）的一端，所述固定件（50）上设置有环形凸沿，所述环形凸沿的半径大于所述第一孔（42）的半径。
4. 根据权利要求1所述的装置，其中，所述连接部（46）呈圆弧形。
5. 根据权利要求1所述的装置，其中，所述第一孔（42）为腰型孔，和/或，所述第二孔（44）为腰型孔。
6. 根据权利要求1至5中任一项所述的装置，其中，还包括：

轴套（20），通过所述第二孔（44）嵌套在所述连接件（40）中，设置为固定在所述螺钉（10）的外表面上，其中，所述轴套（20）靠近所述设备（70）一端的外半径大于所述第二孔（44）的半径。
7. 根据权利要求6所述的装置，其中，

所述轴套（20）远离所述设备（70）一端的外半径能够延展至大于所述第二孔（44）的半径。
8. 根据权利要求6或7中任一项所述的装置，其中，所述轴套（20）的内壁设置有螺纹，所述轴套（20）通过螺纹旋转至所述螺钉（10）的无螺纹部位固定。

9. 根据权利要求 6 或 7 中任一项所述的装置，其中，通过所述螺钉（10）的螺纹加工将所述轴套（20）固定在所述螺钉（10）的无螺纹部位。
10. 根据权利要求 6 或 7 中任一项所述的装置，其中，所述轴套（20）在所述第二孔（44）套在所述螺钉（10）上后固定在所述螺钉（10）的外表面上，其中，所述轴套（20）靠近所述设备（70）一端的外半径大于所述第二孔（44）的半径。
11. 一种连接件（40），包括：
  - 第一孔（42），与防掉凸台（60）的横截面相适配，设置为将连接件（40）可旋转地嵌套在所述防掉凸台（60）上，其中，所述防掉凸台（60）固定在设备（70）上；
  - 至少一个第二孔（44），设置为可旋转地嵌套螺钉（10）；
  - 至少一个连接部（46），所述连接部（46）的两端分别连接至所述第一孔（42）和所述第二孔（44）。

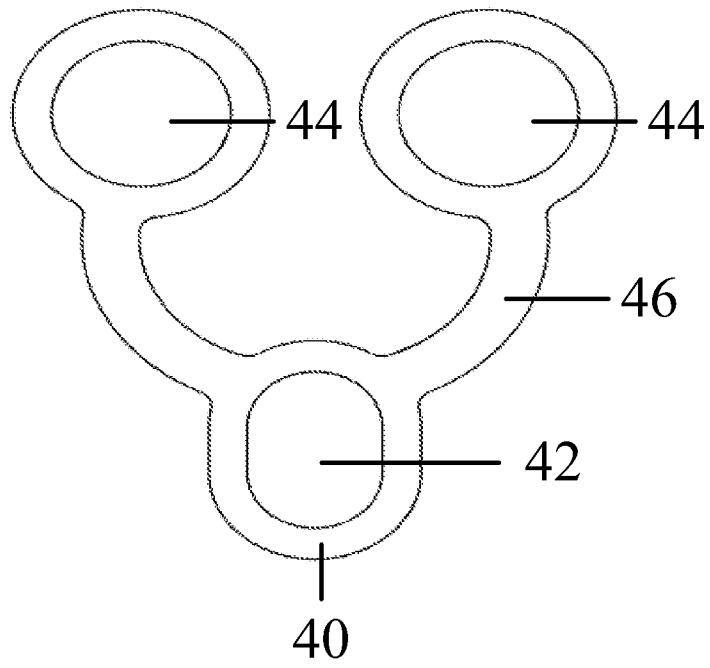


图 1

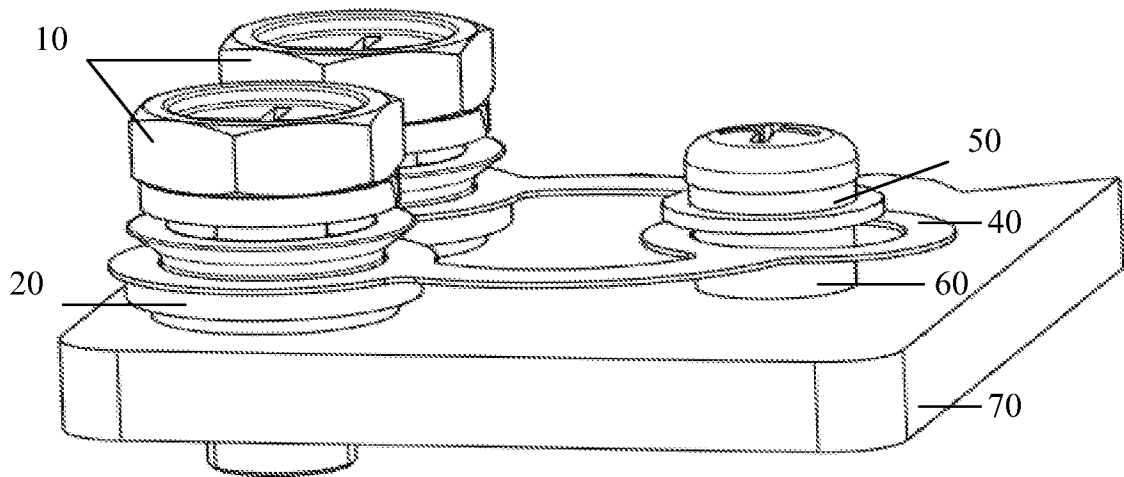


图 2

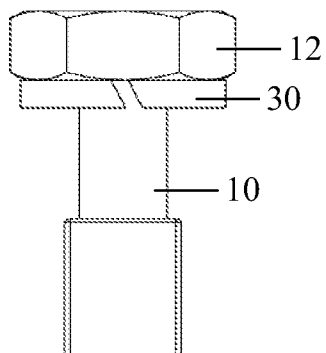


图 3

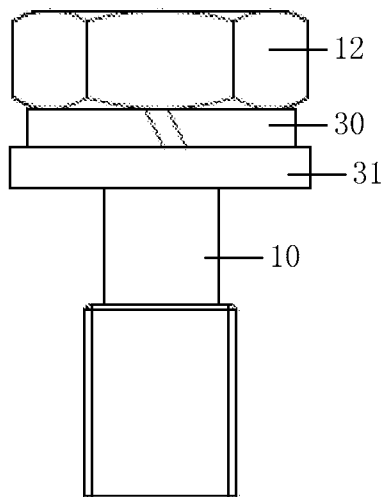


图 3a

3/4

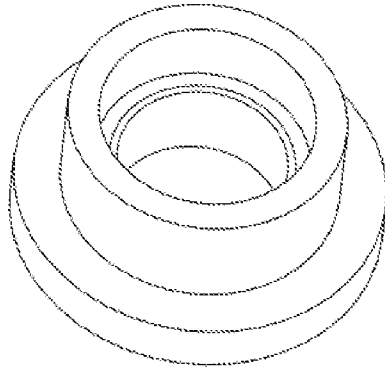


图 4

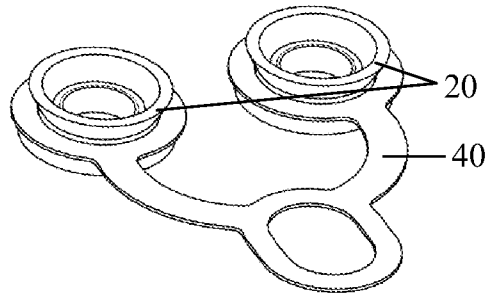


图 5

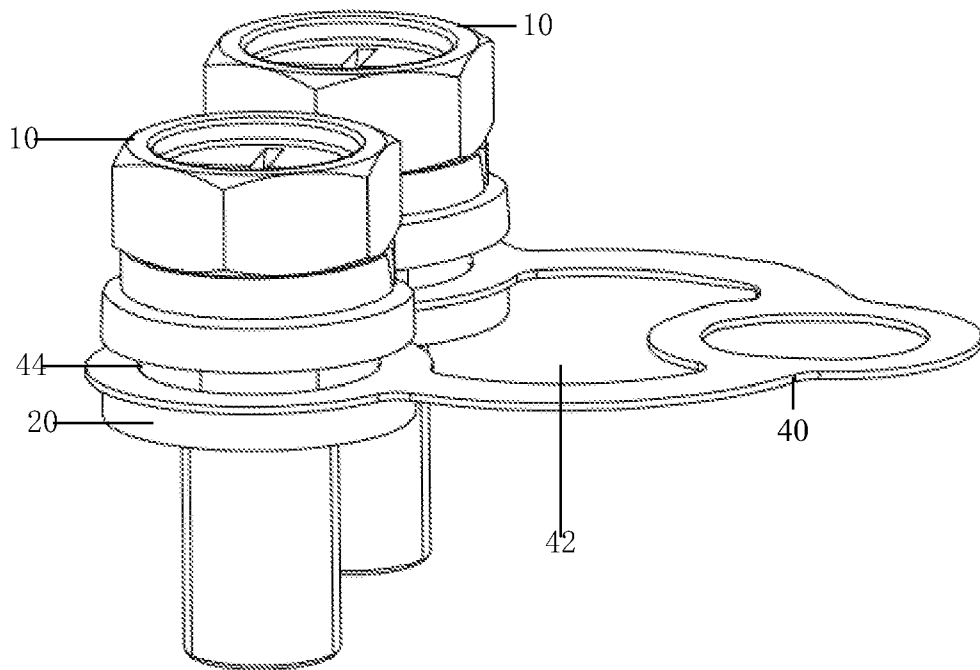


图 6

# INTERNATIONAL SEARCH REPORT

International application No.

**PCT/CN2013/081111**

## 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: F16 B 41/-, 43/-, 39/-, 37/-

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)

EPODOC, WPI, CNPAT, CNKI: AGAINST, PREVENT+, AVOID+, ANTI+, CONNECT+, LOOSE, OFF, FALL+, SLACK, SCREW, BOLT, PIN

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 202756396 U (ZTE CORP.), 27 February 2013 (27.02.2013), the whole document	1-11
X	US 2012152201 A1 (SALAMEH, R.), 21 June 2012 (21.06.2012), description, paragraphs 65-73, and figures 1-4	1-11
A	DE 202008001327 U1 (DR. HAHN GMBH & CO. KG), 16 July 2009 (16.07.2009), the whole document	1-11
A	EP 2278177 A2 (HAVER & BOECKER OHG), 26 January 2011 (26.01.2011), the whole document	1-11
A	US 5174702 A (DOLIN, L.A.), 29 December 1992 (29.12.1992), the whole document	1-11
A	US 2003210968 A1 (MIYAMURA, H. et al), 13 November 2003 (13.11.2003), the whole document	1-11
A	FR 2678352 A1 (PFLIEGER, R.), 31 December 1992 (31.12.1992), the whole document	1-11

Further documents are listed in the continuation of Box C.

See patent family annex.

<p>* Special categories of cited documents:</p> <p>“A” document defining the general state of the art which is not considered to be of particular relevance</p> <p>“E” earlier application or patent but published on or after the international filing date</p> <p>“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)</p> <p>“O” document referring to an oral disclosure, use, exhibition or other means</p> <p>“P” document published prior to the international filing date but later than the priority date claimed</p>	<p>“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</p> <p>“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</p> <p>“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</p> <p>“&amp;” document member of the same patent family</p>
---	---

Date of the actual completion of the international search  
21 October 2013 (21.10.2013)

Date of mailing of the international search report  
**21 November 2013 (21.11.2013)**

Name and mailing address of the ISA/CN:  
State Intellectual Property Office of the P. R. China  
No. 6, Xitucheng Road, Jimenqiao  
Haidian District, Beijing 100088, China  
Facsimile No.: (86-10) 62019451

Authorized officer  
**LI, Jipei**  
Telephone No.: (86-10) **62413858**

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

International application No.  
**PCT/CN2013/081111**

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 202756396 U	27.02.2013	None	
US 2012152201 A1	21.06.2012	WO 2011023425 A1	03.03.2011
		DE 102009039508 A1	28.04.2011
		DE 102009039508 B4	22.06.2011
		EP 2473746 A1	11.07.2012
DE 202008001327 U1	16.07.2009	None	
EP 2278177 A2	26.01.2011	DE 102009034128 A1	27.01.2011
		DE 202010001511 U1	05.01.2011
US 5174702 A	29.12.1992	None	
US 2003210968 A1	13.11.2003	TW 200306772 A	16.11.2003
FR 2678352 A1	31.12.1992	None	

# INTERNATIONAL SEARCH REPORT

International application No.

**PCT/CN2013/081111**

## **A. CLASSIFICATION OF SUBJECT MATTER:**

F16B 41/00 (2006.01) i

F16B 43/00 (2006.01) i

F16B 37/00 (2006.01) i



国际检索报告  
关于同族专利的信息

国际申请号  
**PCT/CN2013/081111**

检索报告中引用的 专利文件	公布日期	同族专利	公布日期
CN 202756396 U	27.02.2013	无	
US 2012152201 A1	21.06.2012	WO 2011023425 A1	03.03.2011
		DE 102009039508 A1	28.04.2011
		DE 102009039508 B4	22.06.2011
		EP 2473746 A1	11.07.2012
DE 202008001327 U1	16.07.2009	无	
EP 2278177 A2	26.01.2011	DE 102009034128 A1	27.01.2011
		DE 202010001511 U1	05.01.2011
US 5174702 A	29.12.1992	无	
US 2003210968 A1	13.11.2003	TW200306772 A	16.11.2003
FR 2678352 A1	31.12.1992	无	

A. 主题的分类:

F16B 41/00 (2006.01) i

F16B 43/00 (2006.01) i

F16B 37/00 (2006.01) i

(19)



(11)

**EP 2 884 120 A1**

(12)

**EUROPEAN PATENT APPLICATION**  
published in accordance with Art. 153(4) EPC

(43) Date of publication:

**17.06.2015 Bulletin 2015/25**

(51) Int Cl.:

**F16B 41/00** <sup>(2006.01)</sup> **F16B 43/00** <sup>(2006.01)</sup>  
**F16B 37/00** <sup>(2006.01)</sup>

(21) Application number: **13827085.5**

(86) International application number:

**PCT/CN2013/081111**

(22) Date of filing: **08.08.2013**

(87) International publication number:

**WO 2014/023253 (13.02.2014 Gazette 2014/07)**

(84) Designated Contracting States:

**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB  
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO  
PL PT RO RS SE SI SK SM TR**

Designated Extension States:

**BA ME**

(72) Inventors:

- **CHEN, Shanjun**  
**Shenzhen**  
**Guangdong 518057 (CN)**
- **LI, Xu**  
**Shenzhen**  
**Guangdong 518057 (CN)**

(30) Priority: **08.08.2012 CN 201220390953 U**

(74) Representative: **Stöckeler, Ferdinand**

(71) Applicant: **ZTE Corporation**

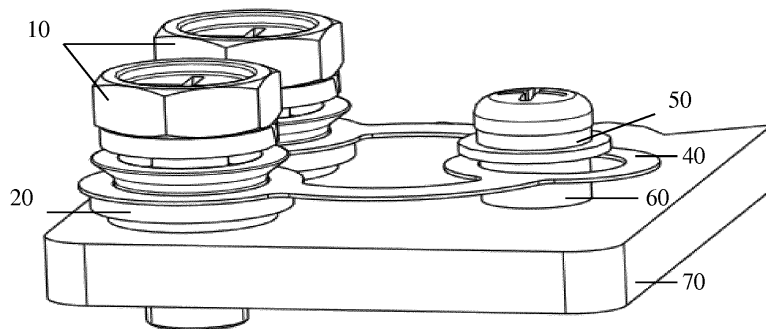
**Shenzhen, Guangdong 518057 (CN)**

**Schoppe, Zimmermann, Stöckeler**  
**Zinkler, Schenk & Partner mbB**  
**Patentanwälte**  
**Radtkoferstrasse 2**  
**81373 München (DE)**

(54) **ANTI-DROPPING DEVICE AND CONNECTING PIECE**

(57) An anti-dropping device and connection member, wherein the anti-dropping device comprises a connection member (40) and an anti-dropping boss (60); wherein the connection member (40) comprises: a first hole (42), which is adapted to a cross section of the anti-dropping boss (60) and configured to rotatably sheath the connection member (40) onto the anti-dropping boss (60); at least one second hole (44), which is configured to rotatably sheath a screw (10) into the connection member (40); and at least one connecting part (46), both ends

of the connecting part (46) being respectively connected to the first hole (42) and the second hole (44); one end of the anti-dropping boss (60) is fixed on an apparatus (70) and is configured to fix the connection member (40) to the apparatus (70). The present utility model solves the problems of inconvenient anti-dropping operation and the dropping of screws during use in the related art, thus facilitating operation and ensuring good safety during use of screws.



**Fig. 2**

**EP 2 884 120 A1**

## Description

### Technical Field

**[0001]** The present utility model refers to the field of assembly, including, e.g., an anti-dropping device and a connection member.

### Background

**[0002]** Screws, as standard parts, can achieve the easy, fast and reliable connection between different parts. Currently, a large amount of fasteners such as screws are used for the fastening and installation of modules and apparatuses in various fields. Due to the limited installation sequence of parts, the installation of many of the parts needs to be carried out at a high altitude, which requires that the falling of the screws are prevented during the use thereof or after the installation is finished. The purpose is to prevent the damage to a person due to the falling of the screw, or to avoid that it is difficult to find the screw after it falls down and further, there is a need to climb up and reinstall.

**[0003]** Some of the existing screw anti-dropping solutions are that: using the method of sheathing an elastic member between screws, or using the method of that a screw and an individual anti-dropping member are sheathed together by an elastic member, so as to realize the anti-dropping function by means of the individual anti-dropping member. There are drawbacks in these methods as follows: the elastic member would rotate during the installation and fastening of the screw; the elastic member may be directly bended; the anti-dropping member needs to be designed separately; and the stuck or over-tightened situation exists between the anti-dropping member and the elastic member, and eventually resulting in an inconvenient operation or a failure.

**[0004]** For the problems of the inconvenient of the anti-dropping solutions in the related art, no effective solution has been yet proposed at the present.

### Summary

**[0005]** For the problems of the inconvenient of the anti-dropping solutions in the related art, an anti-dropping device and a connection member are provided in the embodiment of the present utility model, so as to at least solve one of the above-mentioned problems.

**[0006]** According to one aspect of the present utility model, An anti-dropping device is provided, which comprises a connection member 40 and an anti-dropping boss 60, wherein the connection member 40 comprises: a first hole 42, which is adapted to the cross section of the anti-dropping boss 60 and configured to rotatably sheath the connection member 40 onto the anti-dropping boss 60; at least one second hole 44, which is configured to rotatably sheath a screw 10 into the connection member 40; and at least one connecting part 46, both ends

of the connecting part 46 being respectively connected to the first hole 42 and the second hole 44, and one end of the anti-dropping boss 60 is fixed to an apparatus 70 and is configured to fix the connection member 40 to the apparatus 70.

**[0007]** According to an embodiment of the utility model, the anti-dropping boss 60 and the apparatus 70 are integrally formed by processing.

**[0008]** According to an embodiment of the utility model, a fixing member 50 is further comprised, which is configured to be fixed to one end of the anti-dropping boss 60 away from the apparatus 70, the fixing member 50 being provided with an annular protruding edge, the radius of the annular protruding edge being greater than that of the first hole 42.

**[0009]** According to an embodiment of the utility model, the connecting part 46 is of a circular arc shape.

**[0010]** According to an embodiment of the utility model, the first hole 42 is a waist-shaped hole, and/or the second hole 44 is a waist-shaped hole.

**[0011]** According to an embodiment of the utility model, the device further comprises an axle sleeve 20, which is sheathed in the connection member 40 via the second hole 44 and configured to be fixed to an outer surface of the screw 10, wherein an outer radius of one end of the axle sleeve 20 close to the apparatus 70 is greater than a radius of the second hole 44.

**[0012]** According to an embodiment of the utility model, an outer radius of one end of the axle sleeve 20 away from the apparatus 70 is able to be extended to be greater than the radius of the second hole 44.

**[0013]** According to an embodiment of the utility model, an inner wall of the axle sleeve 20 is provided with a screw thread, and the axle sleeve 20 is rotated by means of the screw thread to a non-threaded portion of the screw 10 for the purpose of fixing.

**[0014]** According to an embodiment of the utility model, a screw thread of the screw 10 is machined such that the axle sleeve 20 is fixed to a non-threaded portion of the screw 10.

**[0015]** According to an embodiment of the utility model, the axle sleeve 20 is fixed to the outer surface of the screw 10 after the second hole 44 is sheathed onto the screw 10, wherein the outer radius of the end of the axle sleeve 20 close to the apparatus 70 is greater than the radius of the second hole 44.

**[0016]** According to another aspect of the present utility model, a connection member 40 is provided, comprising: a first hole 42, which is adapted to a cross section of an anti-dropping boss 60 and configured to rotatably sheath the connection member 40 onto the anti-dropping boss 60, wherein the anti-dropping boss 60 is fixedly provided on an apparatus 70; at least one second hole 44, which is configured to be rotatably sheathed onto a screw 10; and at least one connecting part 46, both ends of the connecting part 46 being respectively connected to the first hole 42 and the second hole 44.

**[0017]** According to the embodiment of the present util-

ity model, an anti-dropping device is employed. The anti-dropping device comprises a connection member 40 and an anti-dropping boss 60, wherein the connection member 40 comprises: a first hole 42, which is adapted to a cross section of the anti-dropping boss 60 and configured to rotatably sheath the connection member 40 onto the anti-dropping boss 60; at least one second hole 44, which is configured to rotatably sheath a screw 10 into the connection member 40; and at least one connecting part 46, both ends of the connecting part 46 being respectively connected to the first hole 42 and the second hole 44, and one end of the anti-dropping boss 60 is fixed to an apparatus 70 and is configured to fix the connection member 40 to the apparatus 70, so that the present utility model solves the problems of inconvenient anti-dropping operation and the dropping of screws during use in the related art, such that a convenient operation and good safety are obtained during use of screws.

### Description of the Drawings

**[0018]** The accompanying drawings described herein are used to provide a further understanding of the present utility model, and constitute a part of the present application, and the exemplary embodiments the present utility model and the description thereof serve to explain the present utility model, and do not constitute improper limitations of the present utility model. In the accompanying drawings:

Figure 1 is a schematic diagram of a preferred connection member according to an embodiment of the present utility model;

Figure 2 is an overall schematic diagram of a preferred anti-dropping device according to an embodiment of the present utility model;

Figure 3 is a schematic diagram of a preferred combination screw according to an embodiment of the present utility model;

Figure 3a is a second schematic diagram of the preferred combination screw according to an embodiment of the present utility model;

Figure 4 is a schematic diagram of a preferred axle sleeve according to an embodiment of the present utility model;

Figure 5 is a schematic diagram of a preferred connection member according to an embodiment of the present utility model in an installed state; and

Figure 6 is a second schematic diagram of the preferred connection member according to an embodiment of the present utility model in the installed state.

### Embodiments of the Utility Model

**[0019]** The present utility model will be described in detail below with reference to the drawings and in combination with examples. It should be noted that the embodiments in the present application and the features in

the embodiments can be combined with each other if there is no conflict.

**[0020]** In this embodiment, a connection member 40 is provided, wherein figure 1 is a schematic diagram of a preferred connection member 40 according to an embodiment of the present utility model, figure 2 is an overall schematic diagram of a preferred anti-dropping device according to an embodiment of the present utility model, as shown in figures 1 and 2, the connection member 40 comprises:

a first hole 42, which is adapted to the cross section of a anti-dropping boss 60 and configured to rotatably sheath the connection member 40 onto the anti-dropping boss 60, wherein the anti-dropping boss 60 is fixed on an apparatus 70; at least one second hole 44, which is configured to be rotatably sheathed onto a screw 10; and at least one connecting part 46, both ends of the connecting part 46 being respectively connected to the first hole 42 and the second hole 44. Preferably, the connection member 40 may be an elastic member.

**[0021]** In this embodiment, by means of the above-mentioned components, the first hole 42 is sheathed onto the anti-dropping boss 60 of the apparatus 70, so that the connection member 40 is fixed to the apparatus 70, and the screw 10 is sheathed in the connection member 40 via the at least one second hole 44 on the connection member 40, such that it is hard for the screw to escape from the connection member 40 during the use of the screw 10, and thereby achieving the function of anti-dropping. Moreover, since the connection member 40 is fixedly sheathed onto the apparatus 70, the screw 10 would not rotate following the connection member 40 due to the vibration of the connection member 40 during the use of the screw 10, so that the rotation and dropping-off of the screw 10 would be avoided. The problems of inconvenient anti-dropping operation and the falling of screws during use in the related art are solved, such that a convenient operation and good safety are obtained during use of screws.

**[0022]** According to an embodiment of the present utility model, figure 3 is a schematic diagram of a preferred combination screw according to an embodiment of the present utility model, as show in figure 3, the above-mentioned screw 10 may be a combination screw. The combination screw comprises a separate screw 12 and spring washer 30. Figure 3a is a second schematic diagram of the preferred screw combination according to an embodiment of the present utility model, and what is differs from figure 3 is that the combination screw comprises a separate screw 12, spring washer 30 and flat washer 31.

**[0023]** As a preferred embodiment, as illustrated with reference to figures 1 and 2, the connecting part 46 may be of a circular arc shape. In this way, when the screw 10 moves in a direction perpendicular to the plane of the

connection member 40, a force which is applied in the perpendicular direction of the connecting part 46 is diffused to both ends of the connecting part 46, thereby the occurrence of direct bending of the connecting portion 46 can be prevented, and the service life of the connection member 40 is to be extended.

**[0024]** According to an embodiment of the present utility model, the first hole 42 may be a waist-shaped hole, and the second hole 44 also may be a waist-shaped hole.

**[0025]** As a preferred embodiment, an axle sleeve 20 may also be respectively sheathed in the second hole 44. Figure 4 is a schematic diagram of a preferred axle sleeve 20 according to an embodiment of the present utility model, and figure 5 is a schematic diagram of a preferred connection member according to an embodiment of the present utility model in an installed state; as shown in figures 4 and 5, the axle sleeve 20 can be sheathed in the connection member 40 via the second hole 44, an outer radius of one end of the axle sleeve 20 close to the apparatus 70 is greater than the radius of the second hole 44, and the axle sleeve 20 can be fixed to the screw 10, so as to prevent the screw 10 from falling out of the connection member 40. In this way, since the axle sleeve 20 is sheathed in the second hole 44, and the outer radius of one end of the axle sleeve 20 close to the apparatus 70 is greater than the radius of the second hole 44, it is hard for the axle sleeve 20 to fall out of the connection member. Furthermore, the axle sleeve 20 is fixed to the screw 10, it is more hard for the screw 10 to fall out of the connection member 40 during use, so that the anti-dropping effect is improved. Moreover, due to the existence of the axle sleeve 20, the detachment of the connection member 40 from the surface of the screw 10 is achieved, so that the connection member 40 and the screw 10 would not follow each other during the rotation, and the connection member 40 may have the anti-dropping function for a variety of types of screws 10, thus avoiding the need for a separate design of the connection member 40, and improving the range of application of the connection member 40.

**[0026]** According to an embodiment of the present utility model, as shown with reference to figures 4 and 5, in case that the axle sleeve 20 is sheathed onto the connection member 40 via the second hole 44, the outer radius of one end of the axle sleeve away from the apparatus 70 is able to be extended to be greater than the radius of second hole 44. In this manner, the screw 10, no matter in the process of moving in an upward or downward movement, would not be disengaged from the connection member 40, so as to further enhance the anti-dropping effect.

**[0027]** In order to fix the axle sleeve 20 to the screw 10, two preferred embodiments are provided in the present utility model as follows:

Embodiment 1, an inner wall of the axle sleeve 20 may be provided with a screw thread, such that the axle sleeve 20 is rotated by means of the thread to

a non-threaded portion of the screw 10, which achieves the function of fixing the position.

Embodiment 2, the inner wall of the axle sleeve 20 may be not provided with a screw thread. For example, during the processing of the screw 10, the axle sleeve 20 is firstly sheathed to a non-threaded portion of the screw 10, and then the screw 10 is processed in a threaded manner, so that the axle sleeve 20 is fixed to the non-threaded portion of the screw 10, which can also achieves the function of fixing the position.

**[0028]** In this embodiment, a further anti-dropping device is provided, as shown with reference to figure 2, the anti-dropping device comprises the above connection member 40 and the anti-dropping boss 60, wherein the connection member 40 comprises: a first hole 42, which is adapted to the cross section of the anti-dropping boss 60 and configured to rotatably sheath the connection member 40 onto the anti-dropping boss 60; at least one second hole 44, which is configured to rotatably sheath a screw 10 into the connection member 40; and at least one connecting part 46, both ends of the connecting part 46 being respectively connected to the first hole 42 and the second hole 44, and one end of the anti-dropping boss 60 is fixed to an apparatus 70 and is configured to fix the connection member 40 to the apparatus 70.

**[0029]** In this embodiment, by means of the above-mentioned components, the first hole 42 is sheathed onto the anti-dropping boss 60 of the apparatus 70, so that the connection member 40 is fixed to the apparatus 70, and the screw 10 is sheathed in the connection member 40 via the at least one second hole 44 on the connection member 40, such that it is hard for the screw to escape from the connection member 40 during the use of the screw 10, and thereby achieving the function of anti-dropping. Moreover, since the connection member 40 is fixedly sheathed onto the apparatus 70, the screw 10 would not rotate following the connection member 40 due to the vibration of the connection member 40 during the use of the screw 10, so that the rotation and dropping-off of the screw 10 would be avoided. The problems of inconvenient anti-dropping operation and the falling of screws during use in the related art are solved, such that a convenient operation and good safety are obtained during use of screws. Moreover, due to the existence of the anti-dropping boss 60, there is a certain connection space between the connection member 40 and the apparatus 70, thus avoiding the case of the connection member 40 being stuck or over-tightened, and further facilitating the operation during the installing of the screw 10.

**[0030]** Preferably, the anti-dropping boss 60 may be fixed to the apparatus 70 in a fastened manner, or may be integrally formed with the apparatus 70 by processing. This method is easy to implement.

**[0031]** During the implementation, there are many manners to sheath the connection member 40 onto the anti-dropping boss 60, for example, since the connection

member 40 is an elastic member, the radius of a port at one end of the anti-dropping boss 60 away from the apparatus 70 may be set to be slightly larger than that of the first hole 42, so that it is not easy for the connection member 40 to fall out of the port after a user applies a force to sheath the connection member 40 onto the anti-dropping 60 boss, and the effect of sheathing the connection member 40 onto the anti-dropping 60 is achieved; however, this method would result in the inconvenient of sheathing due to the different elastic properties of the connection member 40. In this embodiment, another preferred implementing mode is further provided, as shown in figure 2, the anti-dropping boss 60 is of a column shape. After the connection member 40 is sheathed into the anti-dropping boss 60, the fixing member 50 is fixed to one end of the anti-dropping boss 60 away from the apparatus 70. Since the fixing member 50 is generally provided with an annular protruding edge, and the radius of the annular protruding edge is greater than that of the first hole 42, after the fixing member 50 is fixed, the effect of sheathing the connection member 40 onto the anti-dropping boss 60 can also be achieved, and this sheathing method would not result that the connection member 40 cannot be sheathed into the anti-dropping boss 60 due to the different elastic properties of the connection member 40, and thus the range of application of this solution is improved. The fixing member 50 may be a screw, a rivet and the like.

**[0032]** The following will be described in connection with preferred embodiments, the following preferred embodiment and the preferred embodiments are combined with the above embodiment and the implementing mode thereof.

#### Embodiment 1

**[0033]** A screw anti-dropping solution is provided in the present preferred embodiment, such as in the case of preventing the screw from falling down when parts are assembled at a high altitude, of course, it may also be extended to relevant aspects in other fields.

**[0034]** In the screw anti-dropping solution, the rotation of the connection between the connection member and the screw is solved by the screw sleeve during that the screw is screw up. The connection member is directly sheathed onto the anti-dropping bosses designed on the apparatus, so that the problem of that the screw drops from the high altitude during the component installation is solved. Meanwhile, this solution improves the easiness and reliability of installation.

**[0035]** The screw anti-dropping solution may include: a combination screw 10 (including a screw 12 and a spring washer 30), an axle sleeve 20, a connection member 40, and a fixing member 50. The spring washer 30 is installed on the separate screw 12 to form the combination screw 10; the axle sleeve 20 is installed on the combination screw 10 and is assembled with one end of the connection member 40; the other end of the connec-

tion member 40 is directly sheathed onto the anti-dropping boss 60 of the apparatus 70; and then the fixing member 50 is fixed to the anti-dropping boss 60 of the apparatus 70, so that the anti-dropping function of the combination screw 10 is achieved. By means of the axle sleeve 20 connecting the combination screw 10 with the connection member 40, the rotation of the connection member 40 during tightening the combination screw 10 can be prevented.

**[0036]** The connection member 40 may be an elastic member (such as a plastic member), a second hole at one end of the connection member 40 is sheathed to a flange position on the axle sleeve 20, and then the flanged end of the axle sleeve 20 is flared to prevent the connection member 40 from falling off. The connection member 40 may be provided with a plurality of second holes 44 sheathed with the axle sleeve 20 for achieving anti-dropping solutions for different number of screws.

**[0037]** The diameter of the second hole 44 of the connection member 40 sheathed with the axle sleeve 20 and the diameter of the first hole 42 sheathed with the fixing member 50 can be increased according to requirements, or the second hole 44 of the connection member 40 sheathed with the axle sleeve 20 and the first hole 42 sheathed with the fixing member 50 are configured as waist-shaped holes, such that after the connection member 40 is sheathed to the anti-dropping boss, the active space of the combination screw 10 can be bigger, thus ensuring the installation operation more smooth.

**[0038]** The portion on the connection member 40 for connecting the second holes (i.e. the above-mentioned connecting part 46) may be configured to be of a circular arc shape, so that after the fixing member 50 and the combination screw 10 are installed, the connection member 40 can effectively prevent the occurrence of direct bending.

**[0039]** The inner wall, which is matched with the combination screw 10, of the axle sleeve 20 may be provided with a screw thread, the dimensions of the screw thread are the same as that of the screw thread of the combination screw 10, and during assembly, the axle sleeve can be prevented falling off by rotating the combination screw 10 from the threaded portion to the smooth rod portion. The inner wall, which is matched with the combination screw 10, of the axle sleeve 20 may also not be designed with a thread, for example, before the combination screw 10 is processed in a threaded manner, the axle sleeve 20 and the combination screw 10 are assembled, and then the combination screw 10 is threaded, so as to achieve that the axle sleeve 20 would not fall off.

**[0040]** The end of the fixing member 50 fixed to the connection member 40 is positioned on the anti-dropping boss 60 of the apparatus, and the fixing member 50 may be use a screw, a rivet and the like in various forms.

**[0041]** With the screw anti-dropping solution, the present utility model can obtain the following progresses and effects: convenient to install and maintain; simple structure, easy to operate; easy to produce, low costs;

and high versatility.

#### Embodiment 2

[0042] As shown in figure 2, the axle sleeve 20 is assembled with the combination screw 10 in a threaded manner or by other means, ensuring that the axle sleeve 20 would not fall off after the assembly. The first hole 42 at the other end of the connection member 40 is sheathed onto the anti-dropping boss 60, which is configured on the apparatus, and the fixing member 50 is fixed onto the anti-dropping boss 60, so as to prevent the connection member 40 from falling off the end, so that the anti-dropping design of the combination screw 10 during detachment is achieved.

[0043] As shown in figure 3, the screw 12 and the spring washer 30 form a combination screw 10, the screw 12 is provided with a smooth rod, and the smooth rod is assembled with the spring washer 30. Instead, as shown in figure 3a, the screw 12, the spring washer 30 and the flat washer 31 form a combination screw 10, the screw 12 is provided with a smooth rod, and the smooth rod is assembled with the spring washer 30 and the flat washer 31.

[0044] As shown in figure 5, the second hole 44 at one end of the connection member 40 is sheathed to a flange position on the axle sleeve 20, and then the flanged end of the axle sleeve 20 is flared to prevent the connection member 40 from falling off. One connection member 40 can be designed to be matched with a plurality of axle sleeves 20 for satisfying the requirements for preventing a plurality of screws from falling off.

[0045] As shown in figure 4, the axle sleeve 20 may be configured to be of a flanged structure, according to the matching mode thereof with the combination screw 10, a through hole in the middle of the axle sleeve 20 may be designed to be of a threaded structure, and may also be of a non-threaded structure.

[0046] As shown in figure 1, the diameter of the second hole 44 of the connection member 40 sheathed with the axle sleeve 20 and the diameter of the first hole 42 of the connection member sheathed with the fixing member 50 can be increased according to requirements, or the second hole 44 of the connection member 40 sheathed with the axle sleeve 20 and the first hole 42 of the connection member sheathed with the fixing member 50 are arranged as waist-shaped holes, so as to help to make the active space of the combination screw 10 bigger after the connection member is sheathed to anti-dropping boss 60. The portion on the connection member 40 between the second holes may be configured to be of a circular arc shape, so as to prevent the occurrence of direct bending of the connection member 40 after the combination screw 10 is installed. Furthermore, the material of the connection member 40 can also be replaced by other elastic materials.

#### Embodiment 3

[0047] As shown in figure 4, the axle sleeve 20 may be configured to be of a non-flanged structure, according to the matching mode thereof with the combination screw 10, a through hole in the middle of the axle sleeve 20 may be designed to be of a threaded structure, and may also be of a non-threaded structure.

[0048] As shown in figure 3, the screw 12 and the spring washer 30 form a combination screw 10, the screw 12 is provided with a smooth rod, and the smooth rod is assembled with the spring washer 30. Instead, as shown in figure 3a, the screw 12, the spring washer 30 and the flat washer 31 form a combination screw 10, the screw 12 is provided with a smooth rod, and the smooth rod is assembled with the spring washer 30 and the flat washer 31.

[0049] Figure 6 is a second schematic diagram of the preferred connection member according to an embodiment of the present utility model in the installed state, as shown in figures 6 and 2, the second hole 44 at one end of the connection member 40 is sheathed to the smooth rod portion of the combination screw 10, and then the axle sleeve 20 is assembled with the combination screw 10 in a threaded manner or by other means, ensuring that the axle sleeve 20 would not fall off after the assembly. The first hole 42 at the other end of the connection member 40 is then sheathed onto the anti-dropping boss 60, which is configured on the apparatus, and the fixing member 50 is fixed onto the anti-dropping boss 60, so as to prevent the connection member 40 from falling off the end, so that the anti-dropping design of the combination screw 10 during detachment is achieved.

[0050] The above described is only the preferred embodiment of the present utility model, and is not intended to limit the present utility model, and for a person skilled in the art, the present utility model may have various alterations and changes. Any modification, equivalent replacement and improvement made within the spirit and principle of the present utility model should be included within the scope of protection of the present utility model.

#### Claims

1. An anti-dropping device, **characterized by** comprising a connection member (40) and an anti-dropping boss (60), wherein, the connection member (40) comprises: a first hole (42), which is adapted to a cross section of the anti-dropping boss (60) and configured to rotatably sheath the connection member (40) onto the anti-dropping boss (60); at least one second hole (44), which is configured to rotatably sheath a screw (10) into the connection member (40); and at least one connecting part (46), both ends of the connecting part (46) being respectively connected to the first hole (42) and the second hole (44); and

one end of the anti-dropping boss (60) is fixed to an apparatus (70) and is configured to fix the connection member (40) to the apparatus (70).

2. The anti-dropping device according to claim 1, **characterized in that** the anti-dropping boss (60) and the apparatus (70) are integrally formed by processing. 5
3. The anti-dropping device according to claim 1, **characterized by** further comprising: 10
  - a fixing member (50), which is configured to be fixed to one end of the anti-dropping boss (60) away from the apparatus (70), the fixing member (50) being provided with an annular protruding edge, the radius of the annular protruding edge being greater than that of the first hole (42). 15
4. The anti-dropping device according to claim 1, **characterized in that** the connecting part (46) is of a circular arc shape. 20
5. The anti-dropping device according to claim 1, **characterized in that** the first hole (42) is a waist-shaped hole, and/or the second hole (44) is a waist-shaped hole. 25
6. The anti-dropping device according to any one of claims 1-5, **characterized by** further comprising: 30
  - an axle sleeve (20), which is sheathed in the connection member (40) via the second hole (44) and configured to be fixed to an outer surface of the screw (10), wherein an outer radius of one end of the axle sleeve (20) close to the apparatus (70) is greater than a radius of the second hole (44). 35
7. The anti-dropping device according to claim 6, **characterized in that,** 40
  - an outer radius of one end of the axle sleeve (20) away from the apparatus (70) is able to be extended to be greater than the radius of the second hole (44). 45
8. The anti-dropping device according to claim 6 or 7, **characterized in that** an inner wall of the axle sleeve (20) is provided with a screw thread, and the axle sleeve (20) is rotated by means of the screw thread to a non-threaded portion of the screw (10) for the purpose of fixing. 50
9. The anti-dropping device according to claim 6 or 7, **characterized in that** a screw thread of the screw (10) is machined such that the axle sleeve (20) is fixed to a non-threaded portion of the screw (10). 55
10. The anti-dropping device according to claim 6 or 7,

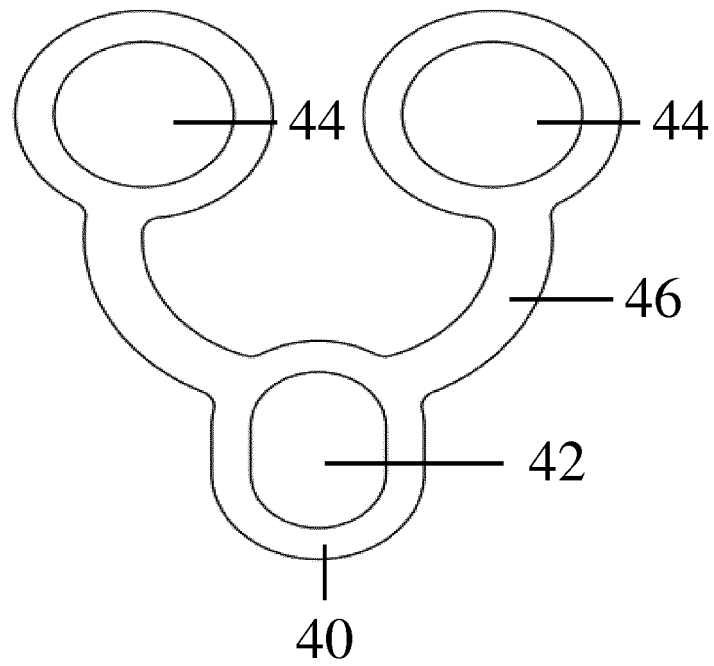
**characterized in that** the axle sleeve (20) is fixed to the outer surface of the screw (10) after the second hole (44) is sheathed onto the screw (10), wherein the outer radius of the end of the axle sleeve (20) close to the apparatus (70) is greater than the radius of the second hole (44).

11. A connection member (40), **characterized by** comprising:

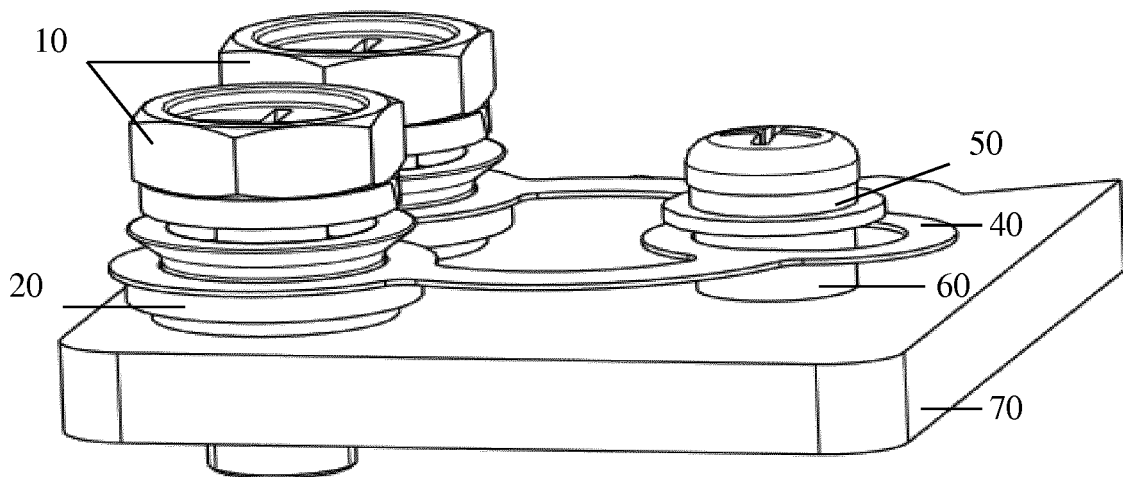
a first hole (42), which is adapted to a cross section of an anti-dropping boss (60) and configured to rotatably sheath the connection member (40) onto the anti-dropping boss (60), wherein the anti-dropping boss (60) is fixedly provided on an apparatus (70);

at least one second hole (44), which is configured to be rotatably sheathed onto a screw (10); and

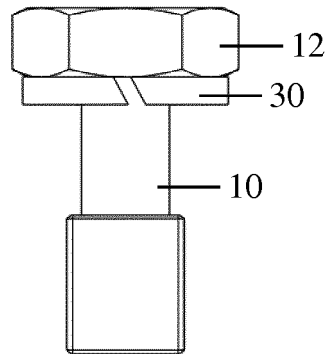
at least one connecting part (46), both ends of the connecting part (46) being respectively connected to the first hole (42) and the second hole (44).



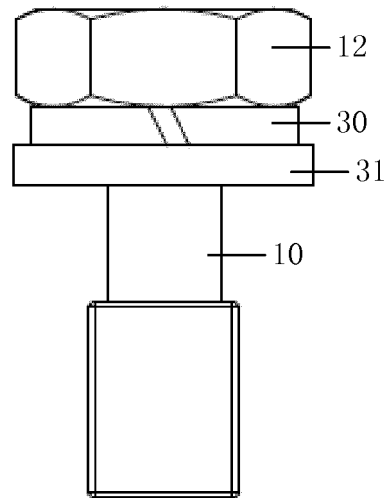
**Fig. 1**



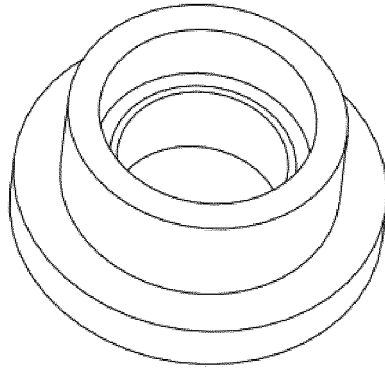
**Fig. 2**



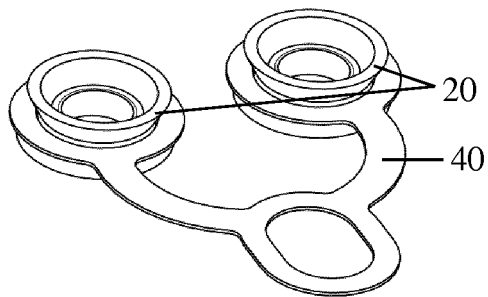
**Fig. 3**



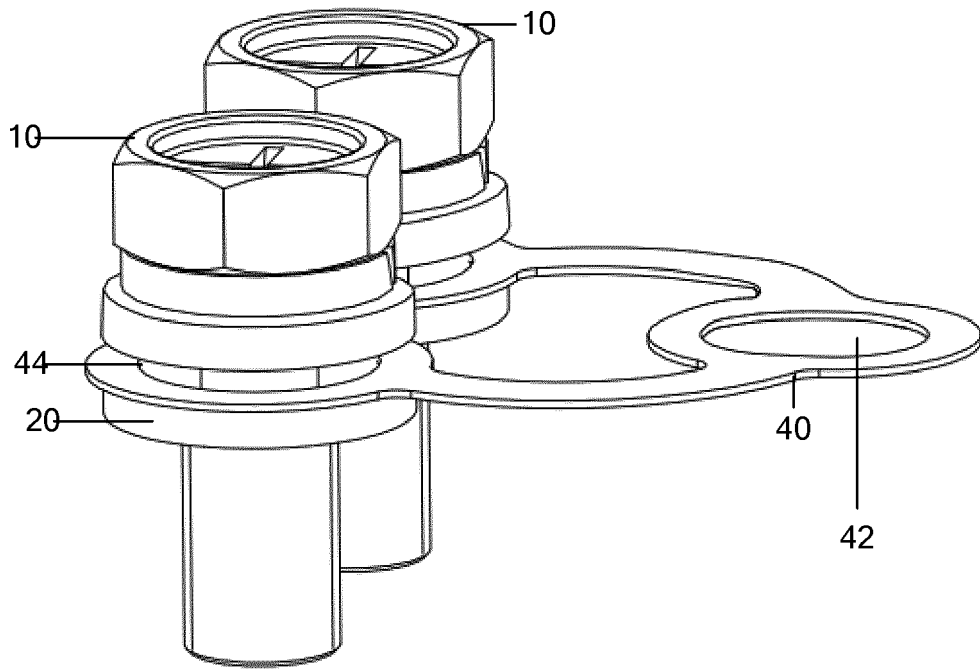
**Fig. 3a**



**Fig. 4**



**Fig. 5**



**Fig. 6**

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2013/081111

<b>A. CLASSIFICATION OF SUBJECT MATTER</b>		
See the extra sheet 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) IPC: F16 B 41/-, 43/-, 39/-, 37/-		
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) EPODOC, WPI, CNPAT, CNKI: AGAINST, PREVENT+, AVOID+, ANTI+, CONNECT+, LOOSE, OFF, FALL+, SLACK, SCREW, BOLT, PIN		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 202756396 U (ZTE CORP.), 27 February 2013 (27.02.2013), the whole document	1-11
X	US 2012152201 A1 (SALAMEH, R.), 21 June 2012 (21.06.2012), description, paragraphs 65-73, and figures 1-4	1-11
A	DE 202008001327 U1 (DR. HAHN GMBH & CO. KG), 16 July 2009 (16.07.2009), the whole document	1-11
A	EP 2278177 A2 (HAVER & BOECKER OHG), 26 January 2011 (26.01.2011), the whole document	1-11
A	US 5174702 A (DOLIN, L.A.), 29 December 1992 (29.12.1992), the whole document	1-11
A	US 2003210968 A1 (MIYAMURA, H. et al), 13 November 2003 (13.11.2003), the whole document	1-11
A	FR 2678352 A1 (PFLIEGER, R.), 31 December 1992 (31.12.1992), the whole document	1-11
<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	
"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 21 October 2013 (21.10.2013)	Date of mailing of the international search report <b>21 November 2013 (21.11.2013)</b>	
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer <b>LI, Jipei</b> Telephone No.: (86-10) <b>62413858</b>	

Form PCT/ISA/210 (second sheet) (July 2009)

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

International application No.

**PCT/CN2013/081111**

5

10

15

20

25

30

35

40

45

50

55

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 202756396 U	27.02.2013	None	
US 2012152201 A1	21.06.2012	WO 2011023425 A1	03.03.2011
		DE 102009039508 A1	28.04.2011
		DE 102009039508 B4	22.06.2011
		EP 2473746 A1	11.07.2012
DE 202008001327 U1	16.07.2009	None	
EP 2278177 A2	26.01.2011	DE 102009034128 A1	27.01.2011
		DE 202010001511 U1	05.01.2011
US 5174702 A	29.12.1992	None	
US 2003210968 A1	13.11.2003	TW 200306772 A	16.11.2003
FR 2678352 A1	31.12.1992	None	

Form PCT/ISA/210 (patent family annex) (July 2009)

**INTERNATIONAL SEARCH REPORT**

International application No.

**PCT/CN2013/081111**

5

**A. CLASSIFICATION OF SUBJECT MATTER:**

F16B 41/00 (2006.01) i

10

F16B 43/00 (2006.01) i

15

F16B 37/00 (2006.01) i

20

25

30

35

40

45

50

55

Form PCT/ISA/210 (extra sheet) (July 2009)

## 摘要

一种防掉落装置以及连接件，其中，该防掉落装置包括连接件（40）和防掉凸台（60），连接件（40）包括：第一孔（42），与防掉凸台（60）的横截面相适配，用于将连接件（40）可旋转地嵌套在防掉凸台（60）上；至少一个第二孔（44），用于将螺钉（10）可旋转地嵌套在连接件（40）中；至少一个连接部（46），该连接部（46）的两端分别连接至第一孔（42）和第二孔（44）；防掉凸台（60）的一端固定在设备（70）上，用于将连接件（40）固定至设备（70）上。其解决了相关技术中防掉落方案操作不便，螺钉在使用的过程中掉落的问题，使螺钉使用过程操作方便且安全性强。