

PARKING STRUCTURE FOR A BICYCLE

Technical Field

- 5 The present invention relates to a parking structure for a bicycle, specifically a double-layer parking structure.

Background

- 10 Parking structures for bicycles are also known as bicycle storage racks, bicycle parking racks, anti-theft bicycle racks, and bicycle placement racks. They are mainly used for parking bicycles or simple electric vehicles so as to protect them from theft, as well as to standardize the means of parking them. With increasing awareness of energy conservation, green commute, and health concerns, more people are
- 15 commuting and travelling on bicycles. Thus, problems associated with the parking of bicycles are becoming more apparent, leading to an emergence of an industry for parking structures for bicycles. Presently, there are problems associated with existing double-layer parking structures for bicycles. For example, when a user places a bicycle on the upper parking frame of the double-layer parking structure, the
- 20 moveable platform may impact and damage the upper parking frame, especially if the user exerts excessive force. Similarly, if the user exerts too much force in retrieving the bicycle from the upper parking frame, the user may become hurt as a result of the speed. This may be a problem as there is no guarantee to the safety of the user during operation of the parking structure. In another example, when the user
- 25 tries to place the bicycle on the upper parking frame, the user may not have sufficient strength to return the moveable platform back to its original position. Thus, the existing parking structure requires the user to be relatively strong in order to conveniently operate it. Therefore, there exists a need for a bicycle parking structure to address at least one of the above problems.

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Disclosure of the Invention

In order to mitigate at least one of the above problems, a first aspect of the present invention provides a double-layer parking structure for a bicycle. The structure
5 comprises a vertical post; an upper parking frame mounted on the vertical post; a moveable platform slideably coupled to the upper parking frame; a support plate coupled to a rear end of the upper parking frame; and an engaging roller arranged at a rear end of the moveable platform. When the moveable platform moves towards the rear end of the upper parking frame, the engaging roller engages with the
10 support plate.

Advantageously, the double-layer parking structure provides the user with the means to slow down the speed of the movable platform when parking the bicycle, thereby avoiding impact and damage to the upper parking frame. Similarly, when the user is
15 retrieving the bicycle from the upper parking frame, the slower speed of the moveable platform reduces the possibility of causing hurt to the user, thereby improving safety.

Preferably, the moveable platform comprises guiding rollers for rolling along a guide
20 at a side plate of the upper parking frame when the moveable platform is moving.

Preferably, the support plate has a wave-shaped structure. The support plate is also preferably coupled to the rear end of the upper parking frame by welding the support plate to, either the rear end of the upper parking frame or a side of the upper parking
25 frame.

Preferably, the double-layer parking structure also comprises a buffer layer under the support plate. The buffer layer is preferred to be a cushion.

30 In order to mitigate at least one of the above problems, a second aspect of the present invention provides a double-layer parking structure for a bicycle. The structure comprises a vertical post; an upper parking frame mounted on the vertical post; a moveable platform slideably coupled to the upper parking frame; a pneumatic

cylinder coupled to a rear end of the moveable platform, with the pneumatic cylinder comprising piston rod; an engaging device coupled to the piston rod; and a crossbar attached to a front end of the upper parking frame. When the moveable platform moves towards the front end of the upper parking frame, the engaging device engages with the crossbar.

Advantageously, the double-layer parking structure allows the user to park the bicycle by making use of the restoring force provided by the pneumatic cylinder. Therefore, the user can return the moveable platform back to its original position with more ease and convenience.

Preferably, the moveable platform comprises guiding rollers for rolling along a guide at a side plate of the upper parking frame when the moveable platform is moving.

Preferably, the pneumatic cylinder has a length between 260 and 270 millimetres, and the piston rod has a length between 65 and 71 millimetres. More preferably, the length of the pneumatic cylinder is 265 millimetres, and the length of the piston rod is 68 millimetres.

Preferably, the pneumatic cylinder is coupled to the rear end of the moveable platform by bolting.

Various features, aspects, and advantages of the present invention will become more apparent from the following detailed description of the preferred embodiments of the invention, by way of non-limiting example only, along with the accompanying drawings in which like numerals represent like components.

Brief Description of the Drawings

Figure 1 shows a schematic diagram of a preferred embodiment of a double-layer parking structure for a bicycle, according to the present invention.

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Figure 2 shows a schematic diagram of a support plate and an engaging roller of a double-layer parking structure for a bicycle, according to the present invention.

Figure 3 shows a schematic diagram of a pneumatic cylinder of a double-layer parking structure for a bicycle, according to the present invention.

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Figure 4 shows a schematic diagram of the pneumatic cylinder according to Figure 3.

Description of the Preferred Embodiments

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In a preferred embodiment of the present invention, the double-layer parking structure 22 in Figure 1 comprises a vertical post 1 and an upper parking frame 2. The vertical post 1 is mounted on the upper parking frame 2. The vertical post 1 is provided with a lower layer parking support structure 3, and a moveable platform 5 is slideably coupled to the upper parking frame 2. The upper parking frame 2 comprises a side plate 21 which is coupled to a protective plate 6. The coupling of the protective plate 6 to the side plate 21 can be, but not limited to, by means of welding. The side plate 21 of the upper parking frame 2 comprises a guide, and the moveable platform 5 comprises guiding rollers. The guiding rollers of the moveable platform 5 roll along the guide of the side plate 21 when the moveable platform 5 is moving.

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For improving the load-bearing strength of the upper parking frame 2, a reinforcing plate 4 is provided around the corner of the vertical post 1 and the upper parking frame 2. The moveable platform 5 is provided with a front guiding roller support structure 7, a rear guiding roller support structure 8, a right side support structure 9, a platform support structure 10, and handles 11. Each of the front guiding roller support structure 7, the rear guiding roller support structure 8, the right side support

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structure 9, the platform support structure 10, and the handles 11, comprises reinforcing support rods, each reinforcing support rod having a diameter of 11 millimetres.

- 5 In one embodiment of the present invention and with reference to Figure 2, a support plate 12 is coupled to a rear end of the upper parking frame 2. An engaging roller 13 is also arranged at a rear end of the moveable platform 5. When the moveable platform 5 moves towards the rear end of the upper parking frame 2, the engaging roller 13 engages with the support plate 12. The support plate 12 has a wave-like structure, such that the crests of the wave resist movement of the moveable platform 5 when the engaging 13 is engaged at the trough of the wave. The coupling of the support plate 12 to the upper parking frame 2 can be performed by, but not limited to, welding the support plate 12 to either the rear end of the upper parking frame 2 or the side plate 21 of the upper parking frame 2. A buffer layer 14 is provided under the support plate 12 and the buffer layer 14 may be, by example and not limitation, a cushion. The buffer layer 14 plays a role in the protection of the support plate 12, such as to prevent deformation of the support plate 12, thereby improving the service life of the support plate 12.
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- 20 Advantageously, the double-layer parking structure 22 provides the user with the means to slow down the speed of the movable platform 5 when parking the bicycle, thereby avoiding impact and damage to the upper parking frame 2. Similarly, when the user is retrieving the bicycle from the upper parking frame 2, the slower speed of the moveable platform 5 reduces the possibility of causing hurt to the user, thereby
- 25 improving safety.

In another embodiment of the present invention and with reference to Figures 3 and 4, a pneumatic cylinder 18 is coupled to a rear end of the moveable platform 5. The pneumatic cylinder 18 comprises a piston rod 19. An engaging device 20 is coupled to the piston rod 19. A crossbar 17 is attached to a front end of the upper parking frame 2. When the moveable platform 5 moves towards the front end of the upper parking frame 2, the engaging device 20 engages with the crossbar 17. The pneumatic cylinder 18 is coupled to the rear end of the moveable platform 5 by, for

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example only, bolting. Specifically, a bolt 16 is bolted through a bolt hole 15. The length A of the pneumatic cylinder 18 is 265 millimetres, and the length B of the piston rod 19 is 68 millimetres. The pneumatic cylinder 18 can provide a restoring force of 900 Newtons.

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When the user pulls out the moveable platform 5 from the upper parking frame 2, the engaging device 20 at the piston rod 19 engages with the crossbar 17 at the upper parking frame 2. The user subsequently lowers the moveable platform 5 towards the ground. The piston rod 19 is extended and the pneumatic cylinder 18 is thus in a compressed state with a restoring force acting on the piston rod 19. The user then places a bicycle on the moveable platform 5 and raises it towards the upper parking frame 2. The restoring force of the pneumatic cylinder 18 and the piston rod 19 causes the extended piston rod 19 to return to its original length, thereby reducing the strength required by the user to return the moveable platform 5 to its original position. Therefore, the moveable platform 5 can be pushed with ease and convenience back to its original position on the upper parking frame 2.

Advantageously, the double-layer parking structure 22 allows the user to park the bicycle by making use of the restoring force provided by the pneumatic cylinder 18. Therefore, the user can return the moveable platform 5 back to its original position with more ease and convenience.

Therefore, specific embodiments of a double-layer parking structure for a bicycle have been disclosed. It should be apparent, however, to those skilled in the art that many more modifications besides those already described are possible without departing from the inventive concepts herein. The present invention is not to be restricted except in the scope and spirit of the disclosure. It is to be understood that the present invention includes all modifications which fall within the scope and spirit of the disclosure and the following claims.

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Claims

1. A double-layer parking structure for a bicycle, the structure comprising:
 - a vertical post;
 - 5 an upper parking frame mounted on the vertical post;
 - a moveable platform slideably coupled to the upper parking frame;
 - a support plate coupled to a rear end of the upper parking frame; and
 - an engaging roller arranged at a rear end of the moveable platform;
 - wherein the engaging roller engages with the support plate when the
 - 10 moveable platform moves towards the rear end of the upper parking frame.
2. The double-layer parking structure according to claim 1, wherein the moveable platform comprises guiding rollers for rolling along a guide at a side plate of the upper parking frame when the moveable platform is moving.
- 15 3. The double-layer parking structure according to claim 1, wherein the support plate has a wave-shaped structure.
4. The double-layer parking structure according to claim 3, wherein the support
- 20 plate is coupled to the rear end of the upper parking frame by welding the support plate to one of the rear end and a side plate of the upper parking frame.
5. The double-layer parking structure according to claim 4, the structure comprising a buffer layer under the support plate.
- 25 6. The double-layer parking structure according to claim 5, wherein the buffer layer is a cushion.
7. A double-layer parking structure for a bicycle, the structure comprising:
 - 30 a vertical post;
 - an upper parking frame mounted on the vertical post;
 - a moveable platform slideably coupled to the upper parking frame;
 - a pneumatic cylinder coupled to a rear end of the moveable platform,
 - the pneumatic cylinder comprising piston rod;

an engaging device coupled to the piston rod; and
a crossbar attached to a front end of the upper parking frame;
wherein the engaging device engages with the crossbar when the
moveable platform moves towards the front end of the upper parking frame.

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8. The double-layer parking structure according to claim 7, wherein the
moveable platform comprises guiding rollers for rolling along a guide at a side plate
of the upper parking frame when the moveable platform is moving.

10 9. The double-layer parking structure according to claim 7, wherein the
pneumatic cylinder has a length between 260 and 270 millimetres, and the piston rod
has a length between 65 and 71 millimetres.

10 10. The double-layer parking structure according to claim 9, wherein the length of
15 the pneumatic cylinder is 265 millimetres, and the length of the piston rod is 68
millimetres.

11. The double-layer parking structure according to claim 7, wherein the
pneumatic cylinder is coupled to the rear end of the moveable platform by bolting.

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