Side parking device based on automobile automatic force drive

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Abstract. With the development of China's economy and the continuous deepening of urbanization, the number of urban private cars has increased dramatically [1]. However, the planning of the community construction was relatively backward at the beginning, this has resulted in many residential areas, especially the old-fashioned ones. The problem of difficult parking is becoming increasingly prominent. Therefore, it is very necessary to design a parking device that can effectively use the existing space and create more parking spaces. In addition, efforts are made to reduce the manufacturing cost of the device, save energy for product operation, avoid complicated maintenance of the device, and reduce potential safety hazards during use. The project team designed a side parking device based on the automatic driving force of the car. The device includes a vehicle-carrying walking module and a motion module. The vehicle-carrying walking module is composed of a laterally movable vehicle-carrying platform device and a safety baffle mechanism, which realizes the lateral movement of the car parking and prevents accidents during the car parking process. The motion module is composed of a cross-cut telescopic mechanism, a transmission mechanism, a driving mechanism, and a ratchet and pawl mechanism, which realizes the functions of parking the car in the warehouse and preventing the car body from slipping. After many discussions, the members of this project team have fully studied the problems of the existing parking devices and the parking difficulties faced by the old-style residential quarters, the project team decided to start from two aspects: first, to overcome Insufficient; then, to meet the actual needs of parking in the community [3].

1. Introduction
According to a survey, most parking devices or systems in China at this stage have problem of complex mechanisms, poor work continuity, and are often accompanied by high energy consumption and high costs. For example, a three-dimensional garage costs millions of dollars without regarding to site costs and needs to occupy more space [2]. Because of these problems, the usage rate of parking devices in old-fashioned communities with small spaces is very low. The difficulty of parking in the old-fashioned community is relatively prominent, so a parking device with a small size and a low cost is needed to improve the existing parking situation.

2. Design

2.1 Overall design ideas
(1) The car can be safely and smoothly parked in the open space, and the less resources it needs to use, the better.
(2) It can automate the required functions and conform to the development trend of the current era.

(3) Improve the utilization rate of vacant land: Based on the above ideas, the team designed this parking device. The working process is as follows: After the device receives the user's use information, the device is pushed out by the motor. After the car is on the platform, the safety baffle is raised, the car is driven in reverse gear, and the power is transmitted to the crank slider-scissors link mechanism through the transmission mechanism through the electromagnetic clutch, thereby pulling the car into the parking space. Just before reaching the extreme position, the clutch is disengaged and the drive mechanism is turned to idle. When the car needs to be driven out, by virtue of the periodicity of the crank slider, the car continues to drive in reverse gear to complete the vertical ejection. At this time, the locking mechanism is running, and the drum is locked, so that the car can drive out normally.

3. Overall design

3.1 Functional design

1) The device can realize the parking and storage function of the car by using the self-driving device of the car, and the device also has its own power supply, which can also realize the parking function for non-energy vehicles.

2) The device can provide a function of a safety baffle when the car is parked on the platform, effectively preventing safety accidents caused by the car due to inertia and other reasons.

After the car is parked in the warehouse, the device uses a ratchet and pawl mechanism to realize self-locking to ensure the safety of the car parked in.

![Overall schematic diagram of the device](image)

3.2 Structural design

1) Safety bezel mechanism

Baffle with buckle
bearing shaft
positioning plate
snap-fit movable trigger plate
spring, electromagnet

A circular reed is installed between the baffle and the rotating shaft, so that the baffle can be automatically turned upward without any limit. The buckle of the baffle is connected to the first bearing shaft closest to the buckle. There are two flexible steel wire ropes to limit the rotation angle of the baffle, so as to prevent the vehicle from walking backwards.
2) Ratchet and pawl locking mechanism

The ratchet and pawl mechanism is designed for the car to exit the platform. When the car needs to drive off the loading platform, the drum must be locked to prevent the car from slipping on the drum. The electric signal is fed back to the single chip microcomputer through the travel switch, and then the steering of the steering gear is controlled. The spring is pulled through the wire rope, so that the pawl locks the ratchet and stops the roller.

4. Feasibility analysis

After we use ADAMS, ANSYS and MATLAB to simulate the machine, we get the following results: The weight of a family car is generally in the range of 1.2t-1.8t, and the device can still maintain various components on the basis of a 2t weight. The smooth operation of our machine, and our drive motor uses YS-5D200GN-24 high-power drive motor, which makes the whole machine move more smoothly and efficiently [4] [5].

5. Innovation

1. Use the combination of crank slider and cross-cut link mechanism to realize the two-way operation of the device.

   The device is provided with two crank slider mechanisms. The two sliders are respectively connected to both ends of the cross-cut telescopic mechanism. The periodic movement of the crank slider mechanism is used to drive the cross-cut telescopic mechanism, thereby realizing unidirectional driving as a two-way device Operation.

2. Use ratchet and pawl linkage lock to ensure that the car can exit the device normally.

   This mechanism is in the motion module. When the car needs to drive out of the platform, it controls a steering gear to steer the wire rope and then the spring through the reel, so that the two pawls can lock the ratchet and lock the drum.

6. Conclusion

The project team developed a side parking device based on the automatic driving force of the car. This device saves the seating space required by the car when it is parked on the normal side, improves the utilization of the plane space of the parking space, and reduces the parking of the owner.
requirements, and effectively regulates the side parking of the driver, so that it can serve the purpose of serving the community.

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