

Trial Production of Electromotive Cart for Physically Handicapped People and People of Advanced Age

— Unchangeability of Visual Point and Comfortable Driving —

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Abstract, Both the physically handicapped people and the people of advanced age drive the electromotive cart of tricycle type the every day. When the public electromotive cart of tricycle type has inclined on the slant road or the bumpy road, the viewing angle of driver is changed at the same time. So the risk of traffic accident is increased. For the improvement of the above problem, the present study has made the electromotive cart installed to the new driver's seat on the basis of the 2π control theory.

1. Introduction

Public electromotive cart is a supportable machine for the movement of both the physically handicapped people and the people of advanced age. If the public electromotive cart is useful for their movements, both the physically handicapped people and the people of advanced age will keep the comfortable life without any help from others. But the constructions of both the house and the road are inconvenient to the movements of the physically handicapped people and the people of advanced age using the electromotive cart. For the electromotive cart is useful to both the physically handicapped people and the people of advanced age, two satisfactory items are shown as follows.

- (1) Electromotive cart has to be useful to both the physically handicapped people and the people of advanced age.
- (2) The constructions on both the house and the road have to be suitable to the driving of an electromotive cart.

When the public electromotive cart of tricycle type has inclined on the slant road or the bumpy road, the visual point of driver, i.e., the physically handicapped people and the people of advanced age has changed at the same time. So the risk of traffic accident is increased for the change of viewing angle on the basis of the change of visual point. When the driver has rapid swung to the handle bar of the public electromotive cart, relations between the direction of the centrifugal force occurred to the upper half part of the body of driver and the movable direction of

the public electromotive cart are given variety to the energy balance. For the result, both the physically handicapped people and the people of advanced age are felt to the oppressive sensations by the unbalance of energy.

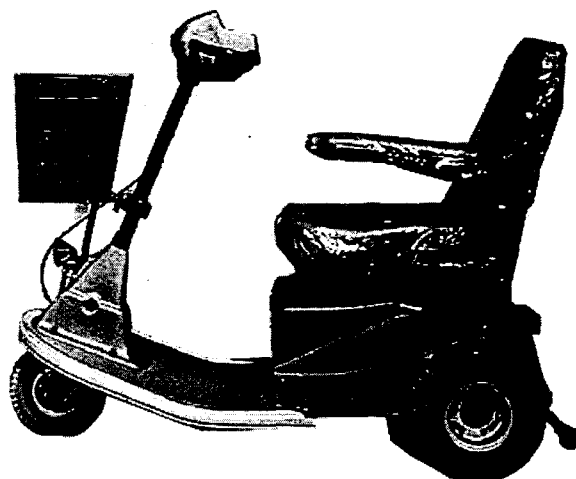


Fig. 1 Public electromotive cart of tricycle type.

A new electromotive cart of tricycle type has made by the improvements of the above problems. Both the wide viewing angle and the comfortable drive have kept by using the new electromotive cart of tricycle type.

2. Problem of public electromotive cart

The public electromotive cart of tricycle type is shown in Fig. 1. All driving apparatus on the public electromotive cart of tricycle type puts on a part of the handle bar for the safety driving. However the above electromotive cart has some problems. The points of problem are shown as follows.

- (1) When both the physically handicapped people and the people of advanced age have got on and off the electromotive cart of tricycle type revolving the driver's seat,

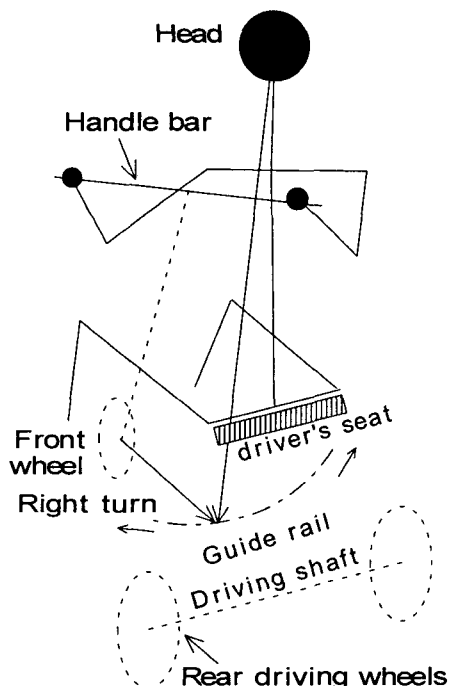
the electromotive cart tends to toward one side. However, they suffer inconvenience for getting on and off the electromotive cart.

- (2) When the driver has rapid swung to the handle bar of an electromotive cart, the public electromotive cart has inclined. Then, the visual point of driver has changed at the same time. Consequently, the risk of traffic accident is increased.
- (3) For the public electromotive cart of tricycle type has not a shock absorber worked by the spring, the total loads of the remainder reduced by the cushions brought from both the seat and the tires are added to the driver. When the public electromotive cart has inclined on the slant road or the bumpy road, the visual point of driver has changed at the same time¹⁾. Consequently, the driver can not be obtained to the correct visual information of the surroundings.
- (4) Public electromotive cart of tricycle type has not a shock absorber worked by the spring. When the driver has rapid swung to the handle bar of an electromotive cart, relations between the direction of the centrifugal force occurred to the upper half part of the body of driver and the movable direction of an electromotive cart are given variety to the energy balance. Both the physically handicapped people and the people of advanced age are felt to the oppressive sensations by the unbalance of energy.

3. Improvement of public electromotive cart

The problems of public electromotive cart had been investigated in Chapter 2 are improved as follows.

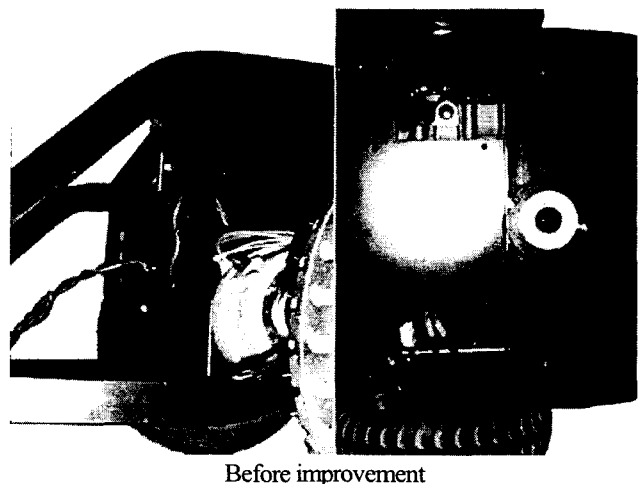
- (1) The center of gravity in a driver's seat on the public electromotive cart of tricycle type indicates the direction of gravitation. So the shaft of driver's seat on the public electromotive cart of tricycle type will be kept the vertical direction compared with the horizontal line.

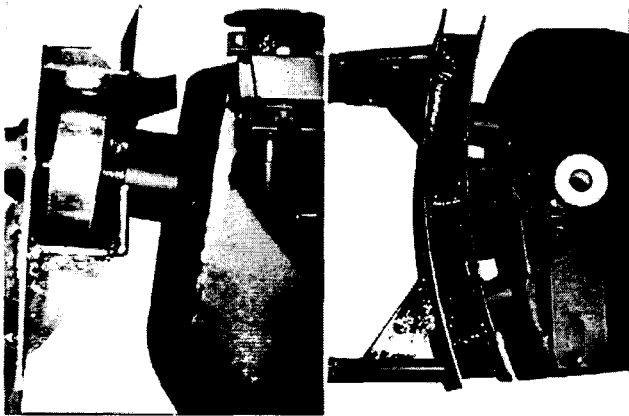


- (2) When the driver has rapid swung to the handle bar of an electromotive cart, the public electromotive cart has inclined. Then, the visual point of driver has changed at the same time. For the visual point of driver cannot be change, the position of driver's seat on the public electromotive cart can be a little move to the direction of centrifugal force²⁾.
- (3) The public electromotive cart of tricycle type has to install the shock absorber.
- (4) When the public electromotive cart has inclined on the slant road or the bumpy road, the visual point of driver has changed at the same time. If the visual point of driver can be kept to the unchange, the viewing angle is kept to the unchange at the same time.

Fig. 2 New driver's seat on the basis of 2π control theory.

By the above items, we have originated with a new driver's seat system on the basis of the 2π control theory. A new driver's seat system on the basis of the 2π control theory has made for the electromotive cart of tricycle type. When the driver's seat on the electromotive cart of tricycle type has inclined on the slant road and the bumpy road, or the driver has rapid swung to the handle bar of an electromotive cart, the gravitation has occurred from both the driver and the electromotive cart of tricycle type, and the centrifugal force has occurred by the swing of the electromotive cart. The composite force of the gravitation and the centrifugal force is indicated by the vector started from the visual point of driver. From the result of the present study, the visual point of driver can be kept to the unchange always. Eventually, the 2π control theory obtained from the present study is indicated by the positional control of driver's seat system in the virtual three-dimensional space, i.e., the semi-spherical surface. The above control method is the 2π control theory using the driver's seat system. The illustration of new driver's seat on the basis of 2π control theory is shown in Fig. 2. When the control method using the 2π control theory has introduced to the driver's seat system, the upper half part of driver's body on the driver's seat can be kept to the unchange.





After improvement

Fig. 3 Joint of forepart and rearpart.

4. Trial production of new electromotive cart

A new electromotive cart of tricycle type has divided into two parts of the forepart and the rearpart. The forepart and the rearpart in a new electromotive cart of tricycle type has connected with both the roller and the rail for the guide of roller. A new driver's seat on the basis of the 2π control theory puts on the forepart of an electromotive cart of tricycle type. The pictures of before and after improvements of the public electromotive cart of tricycle type are shown in Fig. 3. The forepart of a new electromotive cart of tricycle type is constructed by the front wheel, the handle bar, the driver's seat on the basis of a new 2π control theory, and the storage battery, and the rearpart is constructed by the rear wheels, the engine, and the shopping basket. New driver's seat system on the basis of the 2π control theory is constructed by the shaft of the driver's seat on the forepart, and both the rail for the roller and the guide of roller.

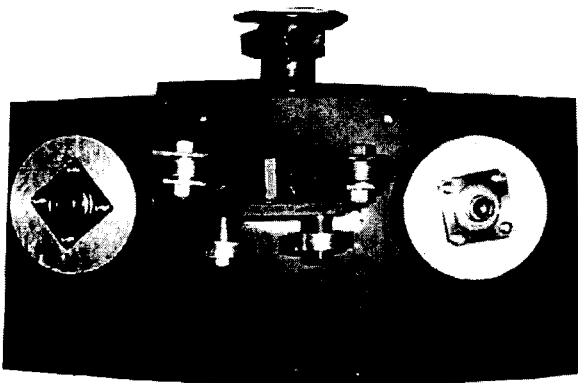


Fig. 4 Picture of roller.

The picture of the roller installed to the forepart of a new electromotive cart of tricycle type is shown in Fig. 4. For the variation of load by adding the weight of forepart, the weight of

seat and the weight of driver on the electromotive cart can be smoothly transmitted to the driving axle of rearpart, the large size of a roller has installed to the forepart of a new electromotive cart of tricycle type.

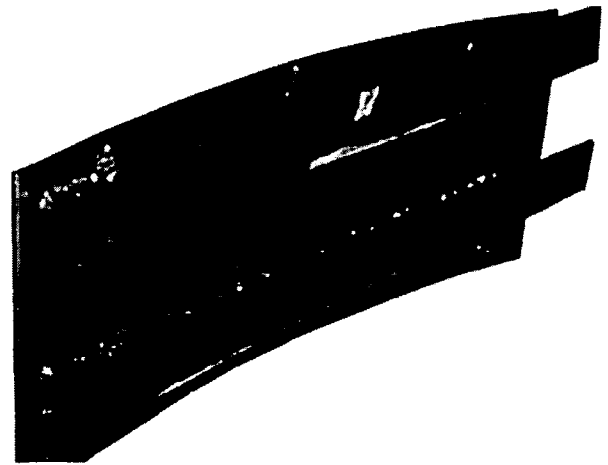


Fig. 5 Rail for guide of roller.

The picture of the rail for the guide of roller installed to the rearpart of a new electromotive cart of tricycle type is shown in Fig. 5. The steel plate of rail for the guide of roller is cut by using the laser process machine, and it is curved by using the plate bending machine. The rail for the guide of roller has made by welding both the steel plate parts and the curved steel plate. For the rail for the guide of roller is influenced from both the compressive load and the tensile load occurred in the joint of the electromotive cart, the rail for the guide of roller has investigated with the durability.

Using the roller of large size, both the compressive load and the tensile load occurred in the roller and the rail for the guide of roller put on the center of the joint in a new electromotive cart of tricycle type, i.e., the roller and the rail for the guide of roller. And the variation of load has controlled.

When the drivers, i.e., the physically handicapped people and the people of advanced age have swung to the handle bar of a new electromotive cart of tricycle type, the rearpart of a new electromotive cart moves drawing an arc alongside the joint at the radius from the visual point of driver to the joint. The visual point of driver can be kept to the unchange always. When the public electromotive cart has inclined on the slant road or the bumpy road, the visual point of driver has changed at the same time. For the visual point of driver can be kept to the unchange, the forepart of the new electromotive cart of tricycle type compared with the rearpart has brought by both the swing of the up and down. viewing angle is kept to the unchange at the same time. So the virtual 2π movement on the semi-spherical surface in the three-dimensional space has brought by both the swing of the up and down for a new electromotive cart of tricycle type and

the move of the roller drawing an arc.

5. Conclusion

Unchangeability of the visual point for the physically handicapped people and the people of advanced age have investigated. The electromotive cart of tricycle type based on the above results has made.

When the physically handicapped people and the people of advanced age have driven the public electromotive cart of tricycle type, the upper half part of driver's body on the driver's seat was swayed on right and left sides. The new electromotive cart of tricycle type has made by improving the construction of electromotive cart. By the results of present study, the upper half part of driver's body on the driver's seat can be kept to the unchange. When the electromotive cart of tricycle type has installed to the driver's seat of a new 2π control theory proposed by the present study, both the physically handicapped people and the people of advanced age will comfortable driving.

References

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