Paper ID: 45886
oral

16th IAA SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FUTURE (D4)
Conceptualizing Space Elevators and Tethered Satellites (3)

Author: Prof. Fumihiro Inoue
Shonan Institute of Technology, Japan, inoue@mech.shonan-it.ac.jp

EXPERIMENT STUDY OF CLIMBER MECHANISM WITH CROSS ROLLER SYSTEM FOR HEAVY LOAD IN SPACE ELEVATOR

Abstract

As one of the technical problem necessary to realize the space elevator plan, the development of a driving mechanism of a climber moving on a tether and its control system is required. Normally, since the climber propels through the friction force between the tether and the driving part, devising and developing a more efficient driving method are desired. Mobility experiments and challenges using small model climbers in various parts of the world have been held, and many excellent climbers have been developed. However, in the development of climbers considering practical use, it is expected that the weight of the climber will be around several tens to several hundred tons, which is not sufficient compared with the model development of about several tens of kilograms developed so far. In the purpose of this research, we examine the method of designing the climber mechanism that can be transported even by the load of high weight comparatively, and confirm the production and the operation situation. In the previous paper, we show the mechanical characteristics of the climber with respect to the roller arrangement and analyzed that the cross position type arrangement propels the climber. In the cross position type, the pressing frictional force that the roller and the tether contact at one point and the surface frictional force of rubbing the roller ad the tether on the face simultaneously act, so that a large frictional force can be obtained. It is expected that a large propulsive force will be generated even with a compact drive mechanism by continuously connecting a plurality of such intersecting drive mechanisms. We have developed an experimental device assuming practical high weight climber by applying conventional driving mechanism. In the developed device, it is possible to convert the driving mechanism of the roller from the opposite type to the non-opposing type or the cross type. By applying the crossing type, it was possible to design a compact mechanism to obtain a load of 100 kg or more. Currently, it is under experiment that combines multiple units and we can expect to build more efficient system. In this paper, the outline of the heavy load climber, driving mechanism, control system and the experimental result are explained in details.