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EXPERIMENTAL STUDY ON CLIMBER MECHANISM APPLYING CROSS ROLLER SYSTEM FOR SMALL MANNED SPACE ELEVATOR

Abstract

One of the technical problems necessary to realize the space elevator plan is required the development of a climber moving mechanism and its control system that moves on the tether. Usually, since the climber is propelled by the frictional force between the tether and the driving part, it is desirable to devise and develop a more efficient driving method. Mobility experiments and challenges using small model climbers were held around the world, and many excellent climbers have been developed. However, in the development of climbers considering practical application, it is expected that the weight of climbers will be on the order of tens to hundreds of tons, which is insufficient as compared with model development of about several tens of kilograms developed so far. In this research, we study the design method of climbing mechanism which can carry even relatively heavy load, and aim to develop compact manned climber for space elevator. In the previous paper, we show the mechanical characteristics of the climber against the roller arrangement and showed that the cross position type arrangement is effective for propelling the climber. In the cross position method, a pressing frictional force at which the roller and the tether contact each other at one point and a surface frictional force rubbing the roller and the tether with the surface simultaneously act, so that a large frictional force can be obtained. By continuously connecting a plurality of drive mechanisms by the cross position method in this manner, it is expected that a large propulsive force will be generated even with a small drive mechanism. Therefore, we developed an experimental apparatus assuming the design and driving mechanism of a small manned climber applying the driving mechanism under study. In this device, a climber was designed to obtain a load of 200 kg or more by applying the crossover method to the drive mechanism. Experiments that combine multiple units are currently being conducted, and more efficient system construction is done In this paper, the outline of a small manned climber, driving mechanism, control system and experimental results were explained in detail.