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MOBILE SYSTEM FOR WATER EXTRACTION FROM ICY REGOLITH USING A THERMAL METHOD

Abstract

Using the Moon's natural resources will enable a much lighter original weight, a cheaper cost of launch, and reduced dependence on supplies from Earth for the lunar settlements and further space exploration activities. The Moon's primary resource of the highest importance for humans is water. Water is necessary for the life support systems of habitat settlements for drinking and growing plants, producing rocket propellant components, and extracting oxygen for breathing. The technology of water extraction on the Moon is selected considering the conditions of its setup and operation before all else. Since ambient conditions on the Moon are very severe: a space vacuum, space radioactive radiation, vacuum ultraviolet light, and considerable temperature drops, the extraction of water and other natural resources requires using different robotic equipment. The apparatus arrives from Earth, this equipment will have limited capabilities. The objective of the work is to select the regions suitable for the operation of small and lightweight robotic systems based on the analytical research of current data concerning the geological situation on the Moon and available water extraction technologies. The analytical research of data concerning the geological situation on the Moon shows that 85–95Systems for water extraction on the Moon must have appropriate outfitting for mechanical extraction, loading, transportation, and delivery of raw materials, a mixture of regolith and ice, to special reactors for processing. These reactors apply heat to extract water through evaporation and condensation after that. A reactor must be capable of collecting, storing, supplying water, and removing waste from the operating area. Equipment is necessary for waste loading, transportation, and putting into storage. Ukrainian specialists have devised a concept of a system combining all these processes in one mobile device based on a robocar manipulator. The core element of this system is a reaction bunker for regolith excavation and water extraction using a thermal method. The base of the robocar is a two-wheel single-axle cart outfitted with two vertical three-sectional telescopic mechanical lifters. Automatic fasteners on the rotary frame secure the mechanized manipulators that support the installation and maintenance of equipment on this frame.