UNDERGROUND PALACE

Team: Astrea

Content

Introduction

We proposed idea of the underground cavity which is created by explosion of fuel leftovers from landing module. The properties of the surface of the Mars will let us to creat living volume with diameter of 5 meters where person can exist without being in danger, perform scientifical researches, and prosper as full-fledged personality.

This scheme gives us following advantages:

1. Protection from space radiation
2. Surfaces creates a shield against meteor showers
3. Fluctuations of the temperature outside are not capable to affect living conditions in the cavity

Astronaut will have to construct electrical drill and screw concrete probe to deliver such explosives as Nitrogen Tetraoxide and Hydrazine to necessary level.

Algorithm

Stage I

1) Preparation (Repair the rover and explore the surrounding area in a powerful layer of clay)
2) (Clay layer/sandstone)
3)Lander -> pull out compressor, power system, take fuel
4) Pump explosive gas/fuel (only inside the vertical sample
5) Create a fuse (a short stutter, organize an explosion from the very bottom)
6) Move as far away as possible
7)Make an explosion (Make sure that all the exhaust gases have left

Stage II. Post-production. Pit treatment

1) Probe the soil (nothing should collapse)

2) Expansion of the entrance to 1.5 meters (Disassemble the rover and assemble the excalator)
3) Method of descent up and down (stairs made of metal, plastic)
4)Pouring concrete, spray paint
5) Mentally prepare to live in the earth
Make the most loaded parts reinforced concrete

Stage III
1) Create a microclimate
2) Print adapters and pipes
3)Proper installation of the first adapter
4) Install 6 tubes (six-pointed star)
3d printer = work on cements and plates
5) Assemble the entire structure -> get a clean frame
Sealing of the sphere is the result of the lll part

Stage IV Habitation:
1) Transfer all life support equipment to the sphere
2) Furniture transformer
3)Entertainment, leisure (billiard table)
4) Live and enjoy your new style of life!

First of all, as a researcher, astronaut will explore territories nearby to find river channels and sustainable clay layer. However, we have a small problem: one of the wheels is broken. To fix that, we will use one of our 3d printers which uses plastic. Now, we do not need to count the amount of material we need because of causes explained below. As a result, astronaut will gain:

Then, using small repairing kit which was also printed from plastic and is for single usage, astronaut will change broken wheel to brand new one. After that, he will start his

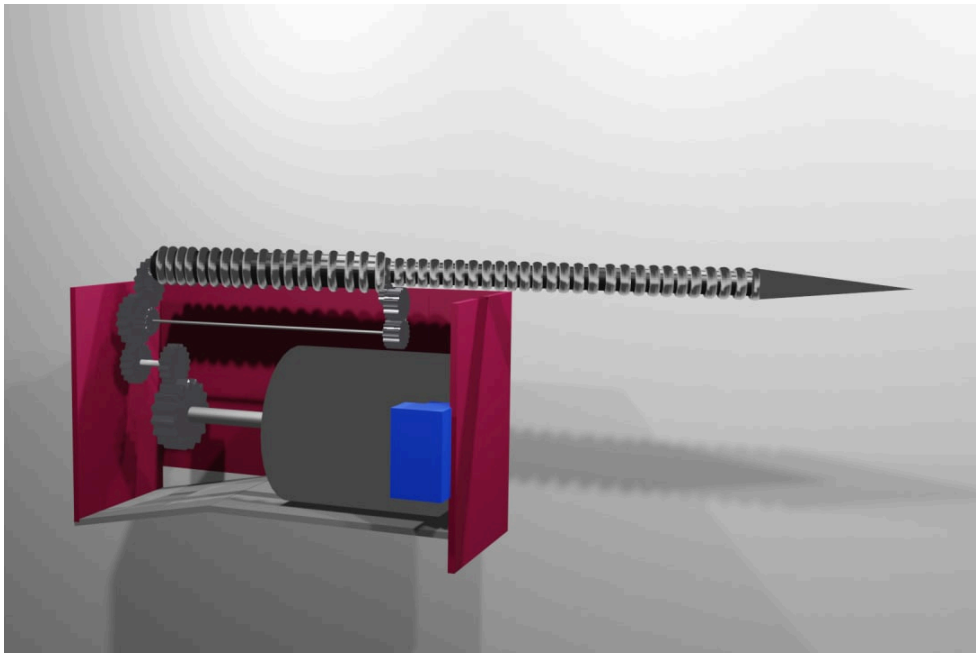
journey with purpose to find necessary clay layer
However, how can he find one? We think that “Eolida” crater is the best region to land on. That is because it is very interesting region in which signs of water existence were found. As a further research, we have to analyze data on-line, i.e. perform analyzis by man or woman. That is why we think he has landed in this particular region. Moreover, mentioned crater includes river channels nearby which limestone can be seen. And wherever you found limestone, know that nearby clay layer is located. Thus, after simple research, astronaut will find necessary clay layer.

Next step is to mark this location, go back, and print with concrete printer specialized concrete probes. They are tubes with inner hole with diameter of 1cm along which two conductor will be passed. They will be used as ignitors of explosion and as way to decrease pressure in cavity. But now, our mission is to print them, connect into 2m segments, load rover with them, and deliver to merked location. Also, special auxiliary spacer column will be printed and delivered to maintain 35 degrees of angle during process of screwing concrete probe.

To implement the conceived idea of obtaining a geodesic sphere (which you will learn about later) under the surface of Mars, it is necessary to drill the rocks of the surface itself. For an optimal solution to the problem, we studied the most favorable locations of the planet, coming to the conclusion that the most favorable environment for further habitation of the territory is the crater located around the circumference of Mount Aeolida (Mount Sherpa). This decision arose based on the previously mentioned facts about the needs of us for the exploitation of clay layers.

In order to drill rocks correctly, we needed to create a drill that would have enough power and the ability to drill the parameters we need without further breakage and dysfunction, and therefore our choice fell on a Screw electric drill with a long-stroke sensor, which is ideally optimized and designed for the specified conditions and parameters.

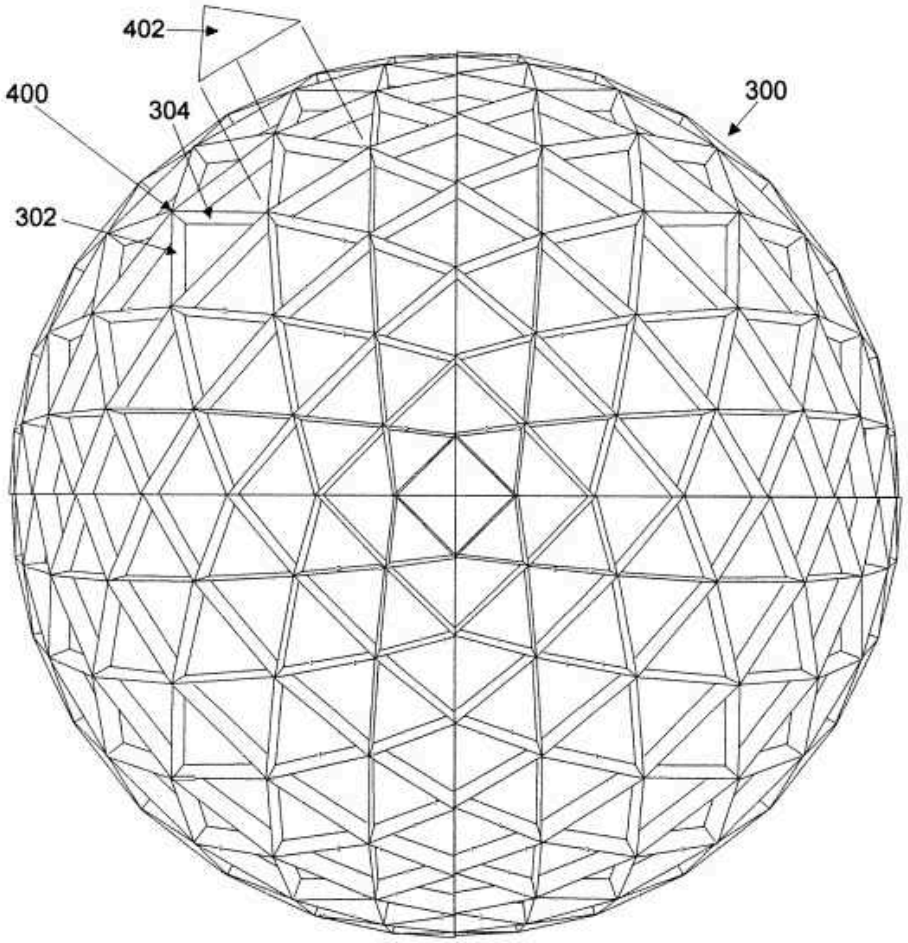
The design is a development using the original projection of this type of drill, but with an extended function to be able to select the desired power (depending on the type of rock and its properties), which allows you to advance the work with complete confidence, without time and opportunity for a mistake. Our additional units are a potentiometer (variable adjustment resistor), as well as a generator, thanks to which we can actually adjust the tempo we set.



The design of the drilling machine is unique in composition and composition. The main difference is the dimensions of our screw Electric Drill: the composition proposed by us exceeds the dimensions of a conventional hand drill by 4 times, which inevitably creates its design to be located on the surface. The scheme and the model proposed by us also shows the presence of a control panel. The energy received by the drill will be extracted by pumping it out from the rover.

After delivering all necessary parts of the process, astronaut will extract 21 kg of Nitrogen Tetraoxide and 31 kg of Hydrazine in liquid form as explosives. He will put them in the first segment and drill it during sunset. All night he well screw probes with power of the engine which was taken from rover. After screwing all probes the ignition of explosives will be performed. After milliseconds, the cavity with diameter of 5 meters will be created. Gases of explosion will go out from concrete valve on the last probe. Congratulations! Now we have place to live in.

Geosphere



The geosphere which will be constructed out of 120 tubes made of concrete is used to be as an egg shell fpr our astronaut. Such form has advantages such as:

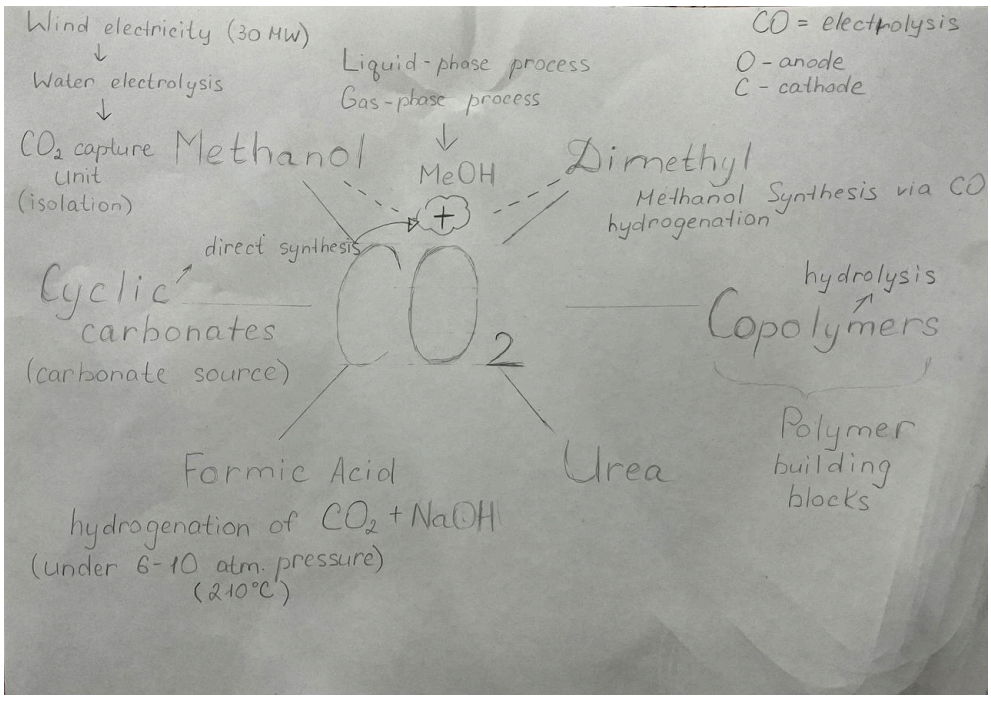
1. Strength.
2. Easy in assembly
3. Maximum volume with minimum surface area

This form is perfect for our mission. After creating the tunnel with diameter of 1,5 meters by new expanding drill bit and disposable spade, astronaut will have

access to cavity and opportunity to built sphere inside. The Mars Suit has to be equipped with servo-mototrs on joints so construction process is not a big deal with usage of printed plastic ladder and block.

Polymer

Creating proper conditions for habitat. CO2- based Polymers for kind existence. To achieve a favorable living environment in our "underground Kingdom", we need to process and design the space in our own way, which is the main task of stages 2, 3 and 4.
The atmosphere of Mars consists of 95% carbon dioxide, or as it is also called, greengas, which is an incredible find for obtaining a new polymer, which is based on CO2, taking over the entire basis of polymerization and obtaining the right material. This innovation was studied multitasking by the team, which led to the discovery.development of a completely new method of polymer manufacturing by introducing a CO2 structure into all polymer components.
Polymer production is carried out in 6 stages, each of which is based on the simplest chemical reactions (for example, hydrolysis or hydrogenation), which means easy polymer production for our astronaut.



The technology of polymer production, and actually the entire polymerization will be used in all stages 2, 3 and 4 stages. To achieve the microclimate of our geosphere, we will combine concrete, which is a component that can also be reproduced in the conditions of Mars, and cover our entire sphere with this admixture. Thus, a constant temperature and a favorable environment for existence are provided. Also, this polymer will be used to produce furniture components in order to provide the most pleasant environment, increase the amount of resource reserves, and produce new possible combinations of raw materials in the future.

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